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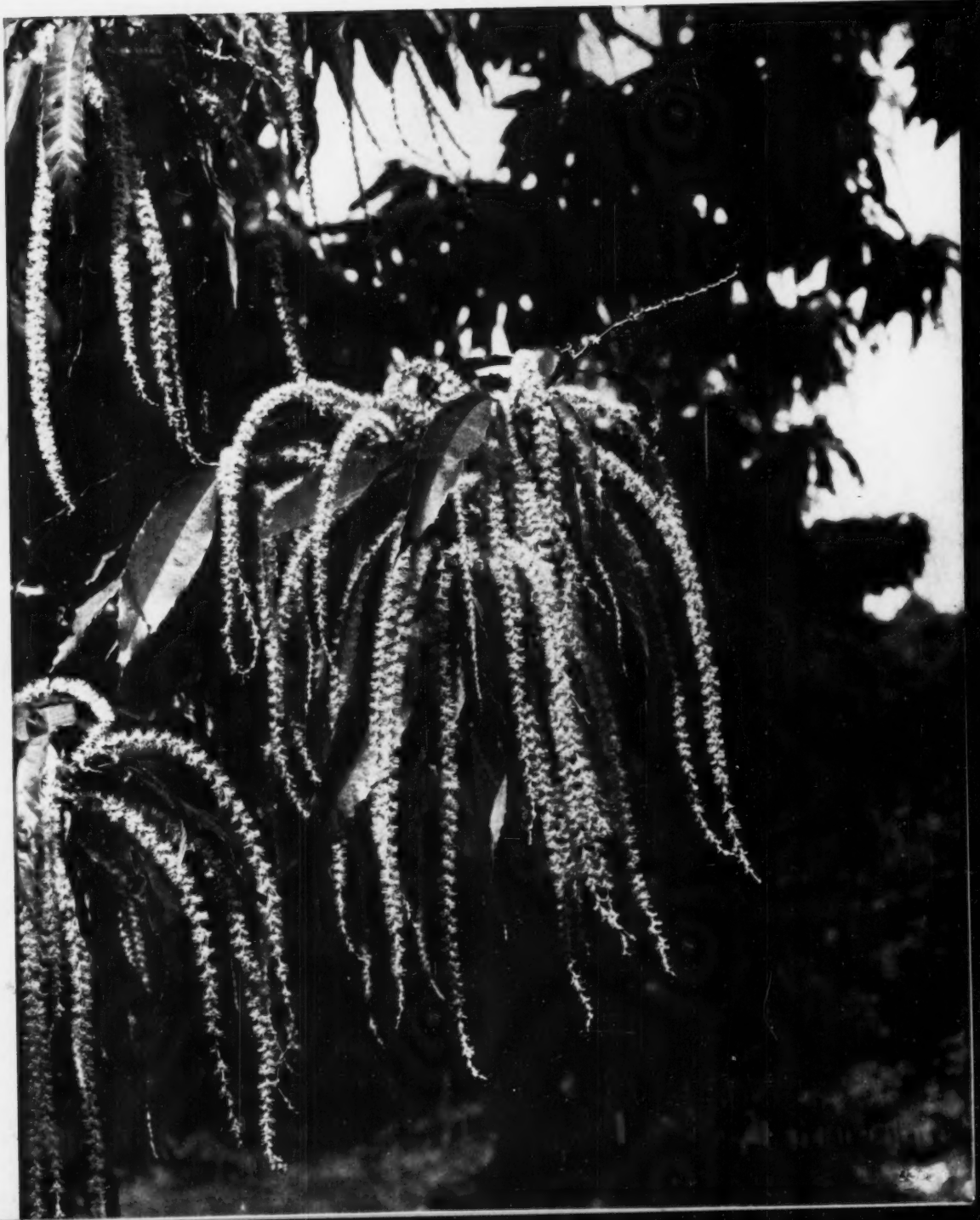

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Photo U. S. Forest Service

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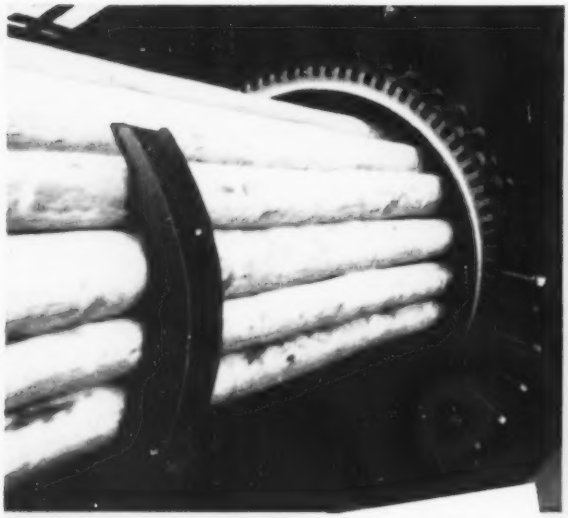

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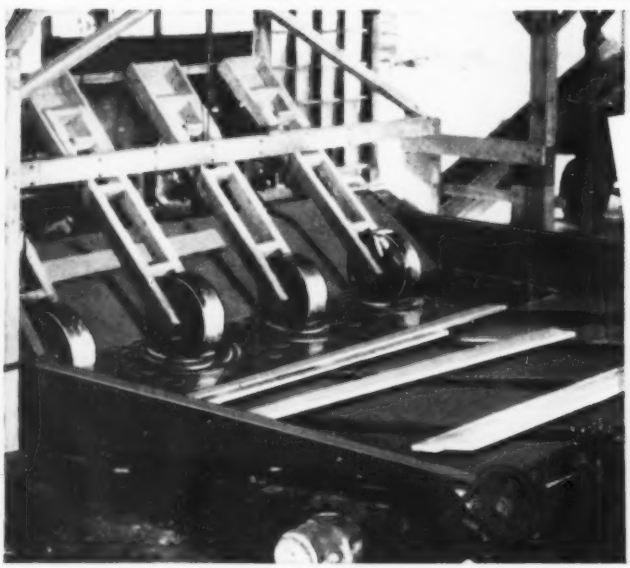

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Fifty Years of Chestnut Blight in America

R. Kent Beattie
and Jesse D. Diller[1]

AT THE BEGINNING of the twentieth century, the American chestnut was one of the most important trees in our eastern forests. The lumber had a pleasing grain and was nearly as good as oak, though a little more porous and somewhat affected by borer holes. These two "defects" made it a good base for absorbing glue and valuable for carrying fine veneers. It produced straight slender trunks with wood moderately resistant to decay and highly esteemed for poles, ties, fence rails, and fence posts. It bore large quantities of edible nuts, food for man and beast. Cultivated in orchards, it was used as an understock for fine European chestnut varieties. It was an especially important shade tree. It was used for fuel. Above all, it developed in its wood and bark more than half the vegetable tannin then produced in America, a tannin especially valuable for making heavy leather.

The chestnut occurred over southern New England and in the Middle Atlantic States, extended west to Indiana and south through the Carolinas to northern Georgia, Alabama, and Mississippi. It was especially abundant and well developed in the mountains of North Carolina, southwestern Virginia, and eastern Tennessee.

When cut down, a chestnut tree sprouted vigorously from the roots and in 18 to 20 years was often replaced by a new crop of 3 to 6 coppice sprouts. If these were cut it coppiced again, thus making the chestnut outstanding among the sprouting species.

FIG. 1.—Virgin stand of chestnut, George Washington National Forest, Virginia. Date unknown. *U. S. Forest Service.*

Into this forest situation, the chestnut blight (sometimes called the chestnut bark disease) burst forth. In 1904 Herman W. Merkel, forester at the New York Zoological Garden in Bronx Park, found some dying chestnut trees in the Garden. Alarmed, he carried material from them to W. A. Murrill, mycologist of the New York Botanical Garden, for study. Dr. Murrill reported that they were infected by a fungus unknown to science. He named it *Diaporthe parasitica* after proving its pathogenicity on American chestnut. Later Anderson and Anderson placed it in the genus Endothia, where it became *Endothia parasitica*.

Endothia parasitica attacks and kills the inner bark and occasionally the sapwood. In addition to the chestnut it is sometimes found on chinkapins, oaks, and other species. It forms cankers, swollen or sunken, only on the parts aboveground. It produces two kinds of spores— a small spore, which is dispersed by rain, insects, and birds, and a large spore, which is dispersed by wind. New infections may be started whenever the spores reach a bark wound that is deeper than the green bark, regardless of the thickness of the bark. The small spores are thin-walled and are extruded from their pustules

[1]Respectively collaborator, Division of Forest Disease Research, and pathologist, Northeastern Forest Experiment Station, Forest Service, U. S. Department of Agriculture.

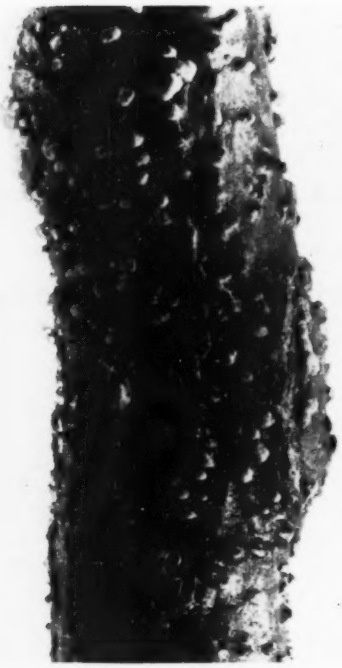

FIG. 2.—*(Left)* View of blight-killed chestnut still standing ghost-like in the Chattahoochee National Forest, Georgia. Photographed in 1941. FIG. 3. *(Upper right)* A diseased branch of chestnut, showing typical pustules and form of spore discharge in damp weather. FIG. 4. *(Lower right)* Typical chestnut blight canker. *U. S. Forest Service.*

in sticky gelatinous threads; the large spores are dry and powdery and are expelled into the air.

In the inner bark, a spore germinates and develops into a fan-shaped mycelial mass, which kills the chestnut's growing tissue, gradually spreading around the twig or trunk and girdling it. The part of the tree above the girdle dies. In some cases numerous sprouts develop below the girdle. How long these new sprouts continue to live depends upon the location and size of the infection and the abundance of infecting spores available. If young twigs are attacked, they alone die, but the spores may wash down the trunk and enter bark wounds, starting new infections.

Only ten years after its discovery, the blight had already spread over half the natural range of the chestnut and was well along on its annihilation of the species. Yet fifty years later, with practically all the chestnut in America gone and fewer blight spores in the air, here and there over the devastated region some blighted trees still send up sprouts that may live a number of years before they are attacked and die back. The occurrence of these living saplings has given the mistaken impression that the American chestnut is coming back.

Spread of the Disease

Some of the eastern states having American chestnuts within their borders did preliminary scouting for the chestnut blight on limited state appropriations. Upon initiating their survey in 1912, Virginia authorities discovered that some early spot infections dated back to the years 1907 and 1908. Attempts to cut out some of the more advanced spot infections to delay the spread of the disease were unsuccessful. Attempts at eradication never quite caught up with other new infections. Then during the ten years 1913 to 1923 the disease swept diagonally across the state, a distance of 240 miles, at the average rate of 24 miles per year. The spread westward across the valley and into the main Appalachian Mountains was steady, though at a slower rate.

Eventually, the most isolated American chestnuts also became infected, as well as the shrubby chinkapins. During the period 1929 to 1934 a few blight infections were discovered in chestnut orchards on the Pacific Coast in Washington, Oregon, and California.

Early Investigations

From 1906 to 1910, while the disease was spreading north, south, and west from New York City, only a few hundred dollars a year of federal money were available for chestnut blight investigations. By 1911 the disease had reached Philadelphia and had begun to kill the big chestnut shade trees. In that year, Congress appropriated $5,000. In 1912, an appropriation of $80,000 was made and this was repeated the following year.

The Pennsylvania legislature appropriated $240,000 for the 1913-1914 biennium, and a Chestnut Tree Blight Commission was appointed. State officials proposed cutting all American chestnut trees in a belt many miles wide across the state, to prevent the blight from spreading to the western part of the state. But before the project could even get under way the disease had already crossed the proposed barrier.

Dr. Haven Metcalf, head of the U. S. Division of Forest Pathology, organized a coperative attack on the problem. He assembled available plant pathologists and assigned them to various phases of the problem. The senior author was brought in to head up the federal work under Dr. Metcalf's supervision. By means of federal funds and some state appropriations, surveys were undertaken to find out the progress of the disease, and cooperative attempts were made to eradicate or control it. But the disease had spread too far to permit eradication. Within forty years of its first discovery the disease reached the extreme limits of the range of the species, killing most of the chestnuts in any particular locality within about fifteen years.

Two schools of thought developed regarding the source of the fungus causing this disease. Relatives of *Endothia parasitica* were growing as saprophytes on dead and dying oak and beech roots, mostly in the South Atlantic States. Some pathologists believed that, under the peculiar drought conditions then occurring, one of the saprophytic Endothias had become parasitic and was causing the disease. If it were a native disease, efforts to eradicate or control it would probably be meaningless. Other pathologists believed that the disease had been introduced from some foreign country. In 1912, C. L. Shear, pathologist in the Bureau of Plant Industry, found saprophytic *Endothia radicalis* in Europe, but he found no signs of the disease-producing *Endothia parasitica*.

Shear, Stevens, and Tiller then made a thorough study of the three related fungi occurring in the eastern states and found them entirely different from the chestnut blight fungus. They published a monograph of the genus Endothia.

Heald and Studhalter, cooperative employees of the Pennsylvania Chestnut Tree Blight Commission and the U. S. Department of Agriculture, solved the important problem of how the small spores of this fungus were carried from tree to tree. A small spore horn, which is a long, twisted, bright yellow to buff, sticky hair-like tendril that appears during moist weather, may contain many thousand small spores. Heald and Studhalter examined a downy woodpecker that had been killed in an infected area and estimated that there were nearly 7,000 chestnut blight spores adhering to its feet. The small spores were found to be readily disseminated by birds, insects, and other animals. Furthermore, rainwater dissolved the spore horns, liberating the small spores, and carried them down the branches and trunks into bark wounds, starting new lower infections.

spore discharge in damp weather. Fig. 4. *(Lower right)* Typical chestnut blight canker. *U. S. Forest Service.*

Heald, Gardner, and Studhalter found that the large spores were shot out into the air from their pustules in the cankers and could be found, under certain conditions, in large numbers up to 300 to 400 feet from the diseased trees. Thus, with two kinds of spores—a small sticky one dispersed by rain, insects, and birds, and a larger spore dispersed by wind—the fungus was equipped for rapid, intensive, and extensive spread.

In the northern Blue Ridge region, G. F. Gravatt of the U. S. Division of Forest Pathology demonstrated that one diseased tree in a newly infected region increases to 7 in one year and to 49 the second year. N. Rex Hunt, cooperating with Dr. J. Russell Smith, the noted promoter of nut growing, in three years of experiments, demonstrated that chestnut blight could not be controlled by spraying.

In cooperative studies, Roy Pierce of the Pennsylvania Commission demonstrated that the disease could not be controlled by tree surgery, and Dr. Caroline Rumbold of the same Commission proved that chemicals injected into diseased trees were ineffective.

In 1913, Americans became alarmed by newspaper stories of people being poisoned by eating chestnuts from blighted trees. Dr. T. C. Merrill proved that nuts from blighted trees were not poisonous.

In the autumn of 1912, a disease that appeared to be similar to the blight was discovered in an isolated orchard of Oriental chestnuts on the Pacific Coast in British Columbia. H. T. Güssow, the Dominion botanist, forwarded specimens to mycologists in the U. S. Department of Agriculture. They proved it to be identical with the blight in the East.

Inspectors working cooperatively with the state forester of North Carolina found in a nursery near Greensboro an independent infection not traceable to New York City. This blight fungus was on imported Japanese chestnut trees, which it was injuring but not killing. It had spread to nearby American chestnuts in the woods. Fortunately, chestnuts were not abundant around the nursery. This infection was eradicated. These two incidents pointed to the Orient as the probable source of the disease which Metcalf had recognized as early as 1908.

In 1913, Dr. David Fairchild of the Office of Foreign Seed and Plant Introduction, U. S. Bureau of Plant Industry, sent killed diseased specimens to Frank N. Meyer, a member of his staff then exploring in northern China, and asked him to search for the disease. In a few weeks Meyer wrote that he had gone "9 days by bullock cart northeast of Peking" to the famous Imperial hunting grounds north of the Great Wall on the edge of Jehol. Here virgin forests still remained and he found diseased specimens, which he forwarded to Washington, D. C. Experienced chestnut blight scouts in Washington, without being told the source of the specimens, pronounced them chestnut blight. Shear and Stevens made pure cultures from them and inoculated healthy isolated chestnut trees. In six weeks it had been proved that the chestnut blight occurred in the Orient. Soon after discovering the disease in China, Meyer found it in Japan also. The Chinese and Japanese trees are more resistant to the blight than the American and European species. In America the disease was clearly an introduction. An exploring expedition to Japan and China was planned, but the approach of the first World War cut off all foreign travel.

All the cooperative work slowed down and almost came to a close in 1914 and 1915 when the chestnut blight appropriations were greatly reduced. The organizations were broken up and the men scattered to other lines of work.

Under direction of G. F. Gravatt, chestnut utilization studies were pushed for ten or twelve years. Standing killed chestnut trees were found to remain sound, and there was no appreciable loss of tannin in the dead wood.

FIG. 5.—This small piece of chestnut bark from China, received by the U. S. Department of Agriculture, June 3, 1913, proved that the chestnut blight fungus originated in the Orient.
U. S. Forest Service.

Tests of Oriental Species

A little progress was also made in getting Oriental chestnuts. P. H. Dorsett of the Office of Foreign Plant Introduction, exploring for fruits and vegetables in China in 1925, shipped from northern China some strains of Chinese chestnut. Nuts were secured from Nanking University also.

By the middle 1920's the disease had reached the heavily chestnut-populated forests of the North Carolina and Tennessee mountains. In this region were most of the factories extracting the tannin essential to the heavy leather industry. Probable losses to this industry emphasized the need of an expedition to study resistant chestnuts in the Orient.

The senior author, assigned by the U. S. Division of Forest Pathology to undertake the project, left for the Orient in June 1927 and returned to Washington in November 1930. In Japan, he found the chestnut to be an important forest tree, used especially for charcoal, poles, and railroad ties. There are 80 or 90 varieties of cultivated Japanese chestnuts.

In Korea, the Japanese chestnut extends over the southern half of the peninsula and up the east coast.

The northern Chinese chestnut has been introduced for nut production and is grown as an orchard tree in the region northwest of Pyengyang.

In China, the Chinese chestnut occurs from the northern Chinese coast west into the mountains of northwestern China and then south in the mountains of Yunnan at about 6,000 feet altitude. It is an important nut-producing tree. Its principal market center in northern China is Tientsin. Henry chinkapin resembles our chinkapins in fruit, but is a forest tree. Seguin chestnut, a small tree about 15 feet high, occurs in southern China. It is not valuable for lumber. Neither it nor Henry chinkapin is valuable as a nut tree, and neither is winter hardy in America.

The senior author shipped over 250 bushels of seed of various strains of forest chestnuts to Washington, D. C. All were hot water treated to kill weevils. To keep them alive they were shipped in properly moistened sphagnum moss in refrigeration. Several hundred trunk sections of chestnuts, chinkapins, and related oaks were also sent for tannin analysis. The Oriental chestnut proved to be as valuable for tannin as is the American chestnut.

About 236,000 trees were obtained from the 250 bushels of nuts. As 1-or 2-year-old seedlings these were distributed to federal and state foresters, to tannin manufacturers, and to other cooperators in all the states from New Hampshire to Alabama and as far west as Iowa. Unfortunately, many of these cooperative experimental forest plantings failed because the sites selected were open, dry, grassy areas, having infertile, shallow soil. Another serious contributing factor in poor establishment was the severe droughts in the early 1930's. But a few plantations succeeded at least in part. Valuable information on the site requirements of the Asiatic chestnut species was obtained.

From 1936 to 1939 the junior author established 21 climatic test plots under forest conditions on federal-and state-owned lands in 8 eastern states. These plots yielded information on blight resistance, form, rate of growth, site requirements, and winter hardiness.

FIG. 6.—A 16-year-old planting of Chinese chestnut on the George Washington National Forest, Amherst County, Virginia. The seed from which these trees originated was brought to Tientsin by camel caravan, from beyond the Great Wall in northern China. *U. S. Forest Service.*

Asiatic chestnuts have proved less winter hardy than the American; their optimum range does not correspond with that of the American chestnut or chinkapin. The Japanese, Seguin, and Chinese chestnuts and the Henry chinkapin are less winter hardy and more restricted in range than the American. U. S. Department of Agriculture Plant Introduction 58602 from Nanking, China, in 1924, has thus far proved superior to all other introduced chestnuts.

In general, the Japanese chestnut has not thrived in the eastern United States, except in limited situations on fertile soil in the more temperate climates of the East and South. It comes from an insular climate influenced by surrounding oceans and does not stand up under our more severe continental climatic conditions. On the other hand, strains of the northern Chinese chestnut come from a continental climate. For generations they have been accustomed to severe cold waves from Siberia or to the mountainous conditions of western China. They have adapted more readily to American conditions.

Breeding Experiments

Chestnut breeding began long before the blight was discovered in America. In 1895, George W. Endicott of Illinois succeeded in making a cross between the Japanese (Giant) variety and an American chestnut, producing the Boone variety. Walter Van Fleet of New York, later with the U. S. Department of Agriculture, dusted pollen of the native chestnut onto the pistillate flowers of a Paragon, a popular European chestnut variety. But the bright struck and killed both Endicott's and Van Fleet's hybrids. Dr. Van Fleet also used native chinkapin and Japanese chestnut as one of his crosses, now known as S-8, which shows up well as a desirable forest-type tree. Both of these pioneer workers contributed much valuable information on the possibility of using different species in breeding. They

also developed useful techniques.

In 1925, R. B. Clapper of the U. S. Division of Forest Pathology began extensive breeding experiments with Oriental and American chestnuts. Many crosses were made and the progeny were carried into succeeding generations.

Tree breeding is a long time work. After a hybrid is produced it is several years before it can develop into a tree with a crop of chestnut seed. A direct Oriental-American hybrid was found to be susceptible to the blight. But if this hybrid is crossed back on the Oriental parent, resistance is obtained. Clapper's best cross (M-16 by American) is produced by crossing Chinese chestnut on an American sprout and back-crossing on Chinese chestnut. It has American form and Chinese resistance.

In 1930, A. H. Graves, then with the Brooklyn Botanic Garden, now of the Connecticut Agricultural Experiment Station, also began breeding a timber-type hybrid. He crossed the Japanese with an American, then crossed this hybrid with a Chinese chestnut parent, producing his best cross which he designates JA x C. Graves also used Van Fleet's S-8, backcrossing it on Japanese, producing a promising tree.

From 1947 to 1954 the U. S. Division of Forest Pathology established 13 hybrid test plots in 11 eastern states. In most of these plots, 50 of Clapper's hybrids, 50 of Graves', and 50 P.I. 58602 were randomized. Already certain of these hybrids are showing superiority over other crosses and over P.I. 58602 in blight resistance, vigor, form, and winter and drought hardiness.

In our eastern forests increased growth of associated species has partially replaced the chestnut. In stands that were 40 to 60 percent chestnut there is a deficiency of wood volume in the present second growth. Also, about half may be of undesirable species. In the South the great loss was not lumber but tannin since entire communities were often dependent on the tannin industry. Even after twenty years standing dead chestnut trees were used. But about 85 percent of the vegetable tannin used in the United States is now imported.

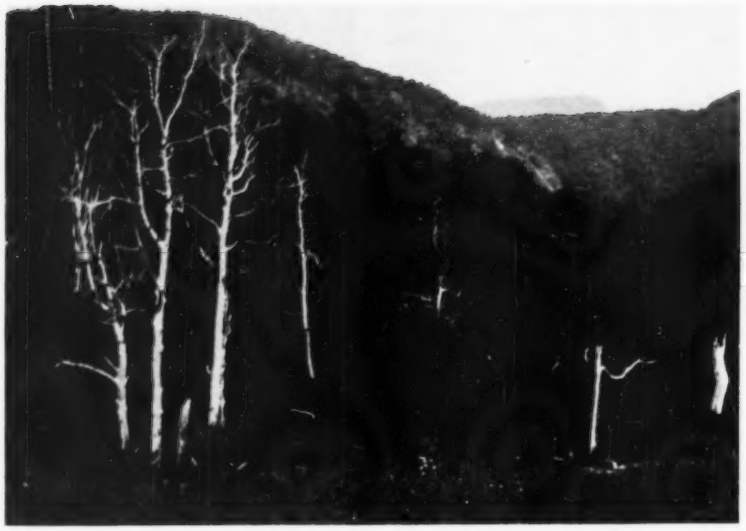

FIG. 7.—Nowhere was the killing of the American chestnut, by the introduced chestnut blight fungus, more keenly felt than in the southern Appalachian region where every fourth tree was a chestnut. Date of photo unknown. *U. S. Forest Service.*

Tests indicate that there are at least one Chinese chestnut introduction (P.I. 58602) and several blight-resistant, timber-type and orchard hybrids of increasingly good quality. There are still factors that must be taken into account. For example, a heavy sleet storm in Pennsylvania in January 1953 broke the tops out of certain Asiatic chestnuts previously considered promising. But P.I. 58602 came through unscathed. In one planting west of the Mississippi River, the oak wilt fungus in three years destroyed nine-tenths of a Chinese chestnut plantation established in 1938. What the oak wilt will do to chestnut in other locations is not yet known.

But despite these uncertainties, interested foresters and farm woodland owners can make small block plantings on well-selected sites, using 25 to 50 trees of Chinese P.I. 58602 and of certain hybrids as they become available. Within a decade these should serve as a source of seed for further spread of the chestnut into other forest areas, thus reestablishing this handsome producer of decay-resistant wood, tannic acid, and nuts valuable for man and wildlife.

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Forestry Education in Chile

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The vast forested areas of Latin America are a little tapped and perhaps not completely evaluated reserve in the world forest resource picture. The development of professional training for foresters in those countries is, therefore, a vital first step in the ultimate utilization and management of South American forest resources.

Excluding the Chilean school discussed in this article, there are only two countries in the entire continent that have schools offering professional training in forestry—Venezuela and Colombia. Both are concerned with tropical forestry. The author tells here of the establishment of training at the University of Chile which will emphasize temperate zone forestry. At the time of his assignment there was a total of 12 Chilean professional foresters; six of these men secured their degrees in the U. S., the others in European schools.

IN JANUARY 1953, the University of Chile, in Santiago, initiated a program of forestry education when it established a degree program in technical forestry in connection with the School of Agriculture. This new endeavor is part of an over-all program pointing toward the planned management and utilization of Chile's natural resources. It is expected that it will provide professional men and skilled technicians for the sawmilling and timber industries and for government service in Chile, and also for such employment in other Latin American countries.

This program is the result of much progressive thinking, over a period of 10 to 20 years, which has taken into account the recommendations of the Special Forestry Mission in 1944 and the more recent Technical Assistance Agreements with the Food and Agriculture Organization of the United Nations (FAO). If the present plans of the government and industry materialize, there should be opportunities in Chile alone for as many as 250 trained foresters within the next six years. The plan of student exchange with other Latin American universities should be of particular benefit to all areas. Both the temperate and the tropical aspects of forestry education can be presented, owing to the varied backgrounds of the current FAO forestry personnel, something that is not possible in most other forestry schools.

Chile is noted for its extremely peculiar geography, varied climate, and wealth of natural resources. The northern section is a salty desert with practically no rainfall, while other sections have as much as 100 inches per annum. Chile's total land area approaches 180 million acres with forest land occupying about 40 million. With a population of 5.9 million, its per capita forest acreage compares well with world figures: Chile 8.0; United States 5.0; and the World 4.2. Also, the forests are rich in virgin old-growth timber, having a volume perhaps three times that of the U. S. The sawtimber volume is estimated at 173 billion board feet, of which 84 percent is in hardwood with four species, coigue, tepa, tineo, and ulmo, comprising more than 73 percent of the total.

The natural timber is concentrated between latitudes 35° and 49° South and 400 to 700 miles south of Santiago, the center of the population. However, more than 500,000 acres of plantations, mainly Monterey pine, eucalyptus, and poplar, are scattered through the Central Valley, north of the natural forests, on and adjacent to the agricultural areas. These plantings are about 25 percent exploitable at present, but high hopes are held

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for this man-made forest of exotics, especially with a current contemplated increase in the production of pulp and paper. The pine grows very rapidly and its reaction to this climate is similar to that of the same species in New Zealand and Australia. Pulpwood from thinnings at 7 to 10 years is being harvested now, with sawlogs at 25 to 30 years averaging 20 to 24 inches in diameter.

The estimated value of the forest land is nearly six billion pesos with acre-values varying from 300 pesos for natural forest areas to 20 pesos for burned and eroded land. The exploitable timber is valued at 16 billion pesos and industrial installations at three billion. (The current bank exchange is 110 pesos for the U. S. dollar.)

The number of workers in forest industries for 1951 was 23,000, which is higher than for any one of the other four major industries, the closest being nitrates with 22,000 workers. Currently the volume of timber being exploited annually is 3,700,000 board feet with only 20 percent being exported. However, the annual depletion from fire is estimated to be 3 to 4 times as much. The natural sawtimber forests are 55 percent privately owned, but these holdings are the more accessible areas. The plantations are nearly all under private ownership, with many operated by societies, insurance companies, and corporations.

This account of Chile's forest resource shows that a program of management is most necessary for both public and private lands, if forest products are to continue to be important factors in the national economy. The management program should be based on full use of all the forest land, and should include both forest management and utilization of forest products. This will require trained personnel, professional technicians in silviculture and engineering, and skilled workers in the woods and plants.

The need and opportunities for men trained in forest practices have been recognized, as the attempts at providing technicians and specific recommendations show. The Special Forestry Mission of 1943-44, made possible through cooperation with the U. S. Department of Agriculture and Chile's CORFO (Corporacion de Fomento de la produccion), surveyed the forestry situation and filed its report, titled "Forest Resources of Chile." One of the report's recommendations was a state-supported system of forest education, to provide professional foresters and trained workers for the industries and government service. It was further recommended that this training might be provided at both the university and the vocational levels.

At the present time, there are only a dozen trained foresters in Chile, in addition to the FAO and TCA experts. The Department of Forestry, though organized since 1943, employs only two of these men; one is with another Government agency, one with the University, and the others in private employment.

In the mid-forties, six young Chileans, graduates from the Agronomy School, gambled on a forestry education in the United States, earned master's degrees at the University of Michigan and returned home. They are currently all leaders in their profession. In 1944 a privately endowed school was started at Victoria and offered university-level training for forest engineers. Due to a shortage of funds it was moved to Temuco in 1948, but finally became inactive in 1951. Some time prior to this effort, the government's Technical University initiated, at its Temuco branch, a two-year program of vocational training in the skills of sawmilling and logging.

Forest research was recognized in early 1951, when the Ministry of Lands and Colonization allotted 1,250 acres within the Llancacura Forest Reserve to the University of Chile for "Experimental exploitation and research in silviculture through the School of Agriculture."

In June 1951, the FAO Forestry Mission entered the picture. Dr. E. I. Kotok, formerly chief of research in the U. S. Forest Service, came to Chile as chief of the TA Groups with requested projects in forestry, agriculture, fisheries, and nutrition. Within six months, three other foresters joined the staff, and their initial efforts in this field were to aid the Chilean government in outlining plans for management, protection, and administration of the public forest lands.

In May 1951, a group of forestry-minded young men started a forestry journal, *Revista Forestal Chilena*, which appeared monthly. Late the next year this same group, joined by certain forest land owners and lumber producers, organized an association of forestry and timber interests, "The Corporacion de la Madera," hired a full-time manager and absorbed the responsibilities of the publication, though the name of the latter was changed to *The Chilena Maderera*.

By April 1952, the interest in forestry and the evident need for men trained in this field culminated in a request from the Chilean government for additional FAO aid in establishing a specific project in forestry education. This supplemental agreement was "to develop a program of study in Silviculture and Utilization of Forest Produce in cooperation with the School of Agriculture of the University of Chile and to instruct Chilean students who had undergone a basic training in Agriculture." FAO would provide:

1. Three forestry professors for the university program, one to arrive in late 1952 in order to assist in the formulation of the curriculum, and two others by January 1953.

2. One director for the research center.

3. Equipment for the demonstration sawmill and logging project amounting to $125,000.

The Government of Chile would provide:

1. Through the University of Chile, funds for the subsistence of the three professors and incidental expenses of the educational project.

2. Through the Ministry of Lands and Colonization, funds for

the expenses of the research center, including the construction and maintenance of the facilities.

Following this action, the subsequent and associated developments formed rapidly. With the assurance of technical training being offered locally, a group of agronomy students became interested in a forestry career. Two technical courses were incorporated in the third-year unit of agriculture during 1952, under the supervision of Professor Hernan Valenzuela R., one of the University of Michigan graduates. He was later designated by the University of Chile as the chief professor of forestry.

The site for the research center was selected within the Llancacura Forest Reserve, about 500 miles south of Santiago, which incorporated the university research lands.

In September 1952 the writer arrived in Chile as the first FAO forestry professor, to assist Professor Valenzuela in developing the forestry curriculum. By December, this outline of forestry courses had been prepared, reviewed, and approved by the Faculty of Agriculture and the Council of University Deans. As noted above, the program is to be associated with agriculture, so the proposal calls for a five-year curriculum with two years of basic agriculture and three years of technical forestry subjects, plus two ten-week periods of practical forestry instruction in summer camps preceding the third and the fourth years. The graduate will receive a Forest Engineer degree.

In outlining the course requirements, data from the Accrediting Committee of the Society of American Foresters, the experiences of fifty forestry schools throughout the world, and the personal views of the several FAO forestry experts were considered, checked and fitted into the Chilean patterns.

The program of courses by years is shown in Table I.

Two major modifications in respect to the instructional procedure of the university were recommended and approved, namely, the adoption of a five-course, two-semester system instead of an unbroken year with 10 courses, and the replacement of the single final examination by a minimum of four tests during the semester.

TABLE I.—PROGRAM OF COURSES IN PROFESSIONAL FORESTRY TRAINING, UNIVERSITY OF CHILE

First and second years with agriculture	
Mathematics	Botany
Chemistry—General, Inorganic, and Physical	Zoology
Statistics	Meteorology
Soils	Geology
Surveying	Drawing
Physics	Plant Physiology
Microbiology	
Third year (first year forestry)	
Conservation	Economics
Construction	Legislation
Accounting	Measurements
Ecology	Genetics
Development of Recreation	Silviculture
	Forest Soils
Fourth year	
Wood Anatomy	Forest Entomology
Hydrology	Management I
Machinery	Forest Policy
Applied Silviculture	Forest Products
Reforestation	Protection
Fifth year	
Management II	Administration
Forest Economics	Forest Finance
Plant Pathology	Forest Entomology
Chemical Utilization	Seminar
Range and Wildlife Management	Thesis

The seven students, who had been interested in forestry during the past year, enrolled in and completed the 1953 summer camp that was located at the Research Center, and which included units of instruction in Dendrology, Reconnaissance, Improvements, Protection, Silviculture and Exploitation.

Formal instruction, covering the third and fourth year units, was initiated on March 23rd at Quinta Normal, the site of the School of Agriculture, with six fourth-year and four third-year students enrolled. There are a dozen forestry-minded young men in the first and second year agriculture groups. The two other FAO professors are C. W. Scott, British, and A. Consigny, French. The University is providing another Chilean forestry professor in addition to Professor Valenzuela, as well as the instructors in the associated fields. There is a wealth of instructional talent available to assist wth special lectures and courses: four other FAO forestry experts—Dr. Kotok; A. H. Stein, British, with thirty years of experience in England, India, and Iran; H. L. Person, an American, director of the Research Center; and Lars Hartman from Finland; two men from the Department of Forestry—Victor Bianchi, Inspector of Parks and Reserves; and Juan Fuentes, forest engineer; one from CORFO—Enrique Rogers, in charge of its Industrial Development Section; and two consulting forest engineers, Jorge Gilchrist and Eduardo Torricelli. Gilchrist, Rogers, Fuentes, and Torricelli are all University of Michigan foresters. Carlos Munoz, Director of Research for the ministry of Agriculture and professor of botany at the University, who assisted with dendrology at the camp, and several instructors from the Schools of Law, Economics, and Engineering are available for special classes. Certainly the advantages of associating the School of Forestry with the University of Chile in Santiago are evident as compared to locating the site of instruction in the timbered area, which earlier was a debated point.

As noted, the research and field training programs are to be lo-

cated at the center in Llancacura Forest Reserve. These projects are now established: the FAO director of research arrived in January, 1953, the sawmill equipment is on hand, the mill is well along toward completion, and housing for supervisory and instructor personnel is being built. Projects in management and utilization research as well as special short-term training courses for government and industry foremen and workers are being outlined. The university foresters will take an active part in this training program and also the research efforts.

Currently, effort is being given to the preparation of a brochure covering the program and offerings of the school. Special lectures and informational material will be available to high schools in several areas. Plans for the future will include extension-type classes, work with 4-H clubs, and information for agriculturists. The curriculum will be reviewed and modified at the end of the current year.

The major problem of this and other professional schools is the one of employment of the graduates, in this case the men who finish in December 1954. It is expected that the current interest in this whole program on the part of the forest industry executives, the government officials, and the public will be maintained at its present high level, which should bring about a satisfactory solution. Staff members and students alike appreciate that standards of achievement must be high, as the performance of the first Chilean trained foresters will set the pace for the whole endeavor.

Evidence of the interest in forestry is cited by recent actions of the National government. In September 1953, following a reorganization of the Department of Forestry under the Ministry of Lands, Professor Valenzuela was appointed Director of Forestry with full responsibility for the department, whose functions were broadened to include action, research and education projects in soil conservation, watersheds, and sand dune control, as well as forest nurseries and national forests and parks. Valenzuela continued to administer the School program. A total of 26 new forestry personnel—college trained men and technicians—were added to the staff.

Also, in the fall of 1953, the National Congress approved a 1954 budget for the forestry department of 37 million pesos as compared to 23 million pesos for 1953. Current legislation provides for:

1. Eighty-nine forestry positions in government service — technical and sub-professional.

2. Appointment of maximum of ten members of each class of graduate foresters from the University of Chile.

3. Formation of a corps of firefighters in the national police organization.

4. Enactment of a forest fire law.

So, this new production line is in operation and the results should aid materially in the development of Chile as well as of Latin America.

Charles P. Wilber (1883-1954)

Charles Parker Wilber died April 5, 1954 at his home 1910 Pennington Road, Trenton, N. J. Until his retirement last December 1, he had served the State of New Jersey as forester and parks official for 43 years.

Mr. Wilber was born in New Brunswick, N. J. October 23, 1883. He received the B.A. and M.A. degrees from Rutgers University in 1905 and 1909, and the M.F. degree from Yale in 1907.

He was with the U. S. Forest Service in Utah during the period 1908-1910. In the latter year he returned to New Jersey as assistant forester and state fire warden. He became state forester in 1922, and in 1937 was given the title of state forester and director of the Department of Conservation and Economic Development.

In addition he had been a member of the New Jersey State Planning Commission and the State Soil Conservation Commission. He was formerly chairman of the New Jersey Parks and Recreation Association, and representative to the National Council of State Parks.

He had been a Member of the Society of American Foresters since 1911, and was chairman of the Allegheny Section in 1926. He was formerly a director of the American Forestry Association, president of the Yale Forestry School Alumni Association, and in 1930 president of the Association of State Foresters. He was the recipient of the Pugsley medal awarded by the American Scenic and Historical Preservation Society.

Mr. Wilber was the author of numerous bulletins and articles on forestry, land use, parks, and recreation.

The Contribution of Its Branches to the Main-Stem Growth of Loblolly Pine

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In an earlier issue of this Journal, Young and Kramer portray the effect of three degrees of artificial pruning on the cross-sectional growth of the main stem of loblolly pine.[2] Their work suggested the problem of the present paper; namely, to determine the effect of tree crown, in terms of certain characteristics of its individual branches, on the cross-sectional growth of the main stem from tip to stump. Their own data, however, were not sufficient for the purpose.

In the fall of 1934 a pruning experiment had been set up on a 4-acre, relatively open stand of 15-year-old loblolly pine in the Duke Forest. Its purpose was to establish the live-crown ratio which, after pruning, should result in maximum volume growth of the main stem below the crown of the individual tree. Nine treatments were imposed so as to leave live-crown ratios of 10 to 90 percent at 10 percent intervals. Each pruning treatment was applied to 30 trees dispersed throughout the stand. Second and third prunings were made after the 1939 and 1944 growing seasons, respectively, so as to maintain the initially established crown ratios.

Ten loblolly pine trees in each of the nine crown-ratio classes of the pruning experiment were made available for the present study. In 1949, the trees were 30 years old and about 55 feet high.

Formulation of the Problem

The current annual growth in cross-sectional area along the main stem between the tip and stump of a pine tree can be expressed as a curved regression line in terms of distance below tree tip, and of distance above root collar, the effect of the latter distance being apparent in the buttswell of all trees.

Alternatively, if P is the distance from tree-tip to a given perimeter of the main stem when expressed as a proportion of main-stem length from tip to stump, it is expected that the contribution of a single branch above P, to the current annual cross-sectional area growth of the main stem at P, may be expressed by the equation

$$Y_P = a + bP + cP^2 + dP^3 + e\left(\frac{1}{1+S-P}\right)$$

in which Y_P is the portion of the area growth at P which represents the contribution of the branch in question; and in which S is a stump height as a proportion of tree length from tip to stump; while $a, -\ -\ -, e$, are numerical coefficients.

It is further expected that certain of these coefficients depend upon the location of the branch and upon certain characteristics of the branch that are highly correlated with the real, but unobtainable, measure of main-stem growth, namely, the leaf surface of the branch. However, readily obtainable characteristics of the branch that are presumably proportional to the number of its leaf-bearing twigs are branch length, and the number of branchlets above twig-size that it contains. If branch-length as a proportion of tree-length be denoted by L, and the number of branchlets to the branch, by N; and if, furthermore, the branch emanates from the main stem at a relative distance D, from the tree-tip, then the average effect of these variables on the first four coefficients above, may be expressed as

$$\begin{aligned} a &= a_0 + a_1 D + a_2 L + a_3 N \\ b &= b_0 + b_1 D + b_2 L + b_3 N \\ c &= c_0 + c_1 D + c_2 L + c_3 N \\ d &= d_0 + d_1 D + d_2 L + d_3 N \end{aligned}$$

Upon, substituting these equivalents into the first equation, we have the expression

$$\begin{aligned} Y_P = {} & a_0 + a_1 D + a_2 L + a_3 N \\ & + b_0 P + b_1 DP + b_2 LP + b_3 NP \\ & + c_0 P^2 + c_1 DP^2 + c_2 LP^2 + c_3 NP^2 \\ & + d_0 P^3 + d_1 DP^3 + d_2 LP^3 + d_3 NP^3 \\ & + e\left(\frac{1}{1+S-P}\right) \end{aligned}$$

This represents the contribution of a single branch to the cross-sectional-area growth of the main stem at perimeter P, when this branch emanates from the main stem above P at a relative distance D from tree-tip, and the branch is characterized by relative length L, and contains N branchlets above twig-size.

Obviously, however, the contribution Y_P of a single branch to the cross-sectional growth at P cannot be measured directly. The directly-measured cross-sectional growth at P represents the contribution of all branches above, and by hypothesis, of no branch below P. Should there be a number, n_P, of branches above P, the measured cross-sectional growth at P represents the sum of all n_P contributions. If, then, an expression like the one just above be written out for every one of the n_P branches above a cross-sectional-area measurement, and added together; then upon denoting the sum by [ ], the cross-sectional-area-growth of the main stem at P is $[Y_P]$. Expressed in terms of the variables discussed above, it takes the form

$$\begin{aligned} [Y_P] = {} & a_0 n_P + a_1 [D] + a_2 [L] + a_3 [N] \\ & + b_0 n_P P + b_1 P[D] + b_2 P[L] \\ & + b_3 P[N] \\ & + c_0 n_P P^2 + c_1 P^2[D] + c_2 P^2[L] \\ & + c_3 P^2[N] \\ & + d_0 n_P P^3 + d_1 P^3[D] + d_2 P^3[L] \\ & + d_3 P^3[N] \\ & + e\left(\frac{n_P}{1+S-P}\right) \end{aligned}$$

This is the basic equation. Once its numerical coefficients are known, it may be made to express the contribution of a single branch of length L, and number of branchlets N, when the branch is located at D (above P); to the cross-sectional-area growth $[Y_P]$, at P, simply by setting $n_P = 1$.

[1] The first named author's contribution is from his dissertation submitted in partial fulfilment of the requirements for the degree of Doctor of Forestry in the School of Forestry of Duke University.

[2] Young, H. E. and P. J. Kramer. The effect of pruning on diameter and height growth of loblolly pine. Jour. Forestry 50: 474-479. 1952.

Under the circumstances of the pruning experiment, the most suitable dependent variable $[Y_P]$, is the 1945-49 cross-sectional-area growth of the tree stem at each of several perimeters P. In the basic equation it should be in terms of P, D, L, and N at the beginning of the 5-year period; that is, at the beginning of the 1945 growing season. Then the equation would represent the regression of periodic growth of the main stem area at perimeter P, on branch location and branch characteristics, and as such it can be fitted to appropriate tree measurements according to the method of least squares to render numerical equivalents of the coefficients.

The Tree Measurements and Their Organization

Within each of the nine crown-ratio classes of the pruning experiment, ten trees, which apparently had enjoyed unrestricted growing space, were chosen for the study. The selection of the trees in the 80 and 90 crown-ratio classes proved somewhat perplexing because the natural pruning of their lowermost branches precluded the retention of their assigned live-crown ratios. Accordingly, the longest-crown individuals of these classes were chosen. No tree with a broken or an abnormally crooked top was accepted.

Tree measurements were taken during the fall-winter season of 1949-50. Upon felling, each tree was bucked into 10 sections of equal length from tip to 1-foot stump. A stem analysis was then made of its 5-year growth by taking inside bark diameters at the end of the 1944 and 1949 growing seasons, at the base of each section. Tree-length and each branch-length as of 1944 were obtained by clipping off tips with pruning shears until just five annual rings were made visible. While this device is not highly precise, each recorded length is believed to be within a half-foot of its true dimension. The 1944 tip of tree was recorded as a branch of zero length.

Upon measuring branch-length, the approximate location of its base within the span of its tree-section was also recorded, and the number of its branchlets counted. For present purposes, a branchlet was defined as an off-shoot from a main branch, provided its diameter outside bark was at least one-half inch at a distance from its base of five percent of tree-height; but if this same off-shoot from the main branch was at least one-half inch in diameter at a distance from its base of 15 percent of tree-height, it was recorded as two branchlets.

The organization of the field record of each tree in terms of the variables of the basic equation was rather detailed. Starting with the base of the second section from tree-tip (because the 1944 tree-height was usually about 10 percent less than the 1949 height) the stem analysis provided the 1945-49 cross-sectional area growth in square inches, symbolized as $[Y_P]$ in the basic equation. Then the number of branches in this section, including one for the tip, supplied the variable n_P; the sum, over all n_P branches, of their relative distances from the tip rendered $[D]$; the sum of their relative lengths rendered $[L]$; and the number of branchlets over all n_P branches rendered $[N]$.

The value of P at this cut varied somewhat from tree to tree, because the section-length was one-tenth of the 1949 tree-length. P, P^2 and P^3 were then multiplied by n_P, $[D]$, $[L]$, and $[N]$ to give the next 12 variables of the basic equation. Finally, the number n_P of branches was divided by the relative distance from root-collar to P for the variable $n_P/(1.021-P)$. In this last expression, $(1+S)$ was taken as a constant 1.021, since the 1944 tree heights were close to 50 feet, and stump heights were uniformly one foot.

The field record appropriate to the next cut of the tree stem was organized in like manner. The value $[Y_P]$ at the base of this cut was calculated from the stem analysis. The number of branches n_P, above this cut is, of course, the number above the preceding cut plus the number emanating from this section. The values of $[D]$, $[L]$, and $[N]$ appropriate to this cut are those of the preceding section plus the respective additions thereto, contributed by this section. The new value of P is the distance from this cut to the 1944 tree-tip, as a ratio of the 1944 tree-length.

The data appropriate to each of the remaining sections were organized in the same way.

When completed, the entire body of data is distributed over nine sections of tree, on ten trees of each crown-ratio class, and over nine crown-ratio classes. Upon taking the average over the 10 trees for each section and crown-ratio class, the regression analysis is based upon 81 observations of 18 variables each, as given by the basic equation.

Analysis of the Data and Discussion of Results

In the application of the method of least squares to the solution of the basic equation, each of the 81 observation equations was assigned a weight inversely proportional to its value of n_P. After the first solution, a series of tests disclosed that 10 of the 17 independent variables were of no significance. Upon dropping these from further considerations and then re-solving, the final equation is the following:

$$[Y_P] = 0.9643\, n_P - 2.1151\, [D] + 0.2714\, [N] - 3.3454 P n_P + 5.5584\, P^2 n_P - 3.1713\, P^3 n_P + 0.01369 \left(\frac{n_P}{1.021 - P} \right)$$

in which $[Y_P]$ is the calculated 1945-49 cross-sectional-area growth of the main stem at P, in square inches.

As shown in Table 1, the equation accounts for 56.4818, or 92 percent of the sum of squares per branch around the general mean (61.5738). But a peculiarity of the basic data not evident in the equation, is that the sum of squares of residuals (5.0920), which is made up of the discrepancies between actual and calculated growth, is in part ascribed to the differences among different trees, as represented by the nine treatment groups;

and in part, to the remaining discrepancies at different perimeters of the same tree group.

In a search for a residual pruning effect over and above that given by the equation, the residuals were collected according to the treatment groups, and their sums of squares per branch are also listed in Table 1. That the very significant treatment group effect is not residual pruning effect, is apparent from the following average residuals per branch listed in order according to crown-ratio class 10, 20 . . . 90; +0.010, —0.034, —0.033, —0.039, +0.014, +0.036, —0.006, —0.011, +0.036.

When plotted on their crown-ratio class, these average residuals show no systematic trend whatever.

Perhaps the best way of presenting the basic equation graphically is to insert into it the independent variable averages, first, for the successive sections of the trees of crown class 10; then of 20; etc. To this end, there are listed in Table 2, the average specifications per tree of crown-class 90, according to 10 sections from its 1944 tip to stump. The first two lines show the composition of the crown for a live-crown ratio of 10 percent; the first three lines, that of a live-crown ratio of 20 percent; etc. For the sake of simplicity in arranging the independent variables, it is supposed that the branches of each section emanate from mid-point of section-length.

The solution of the equation for several crown-ratio classes are presented graphically in Figure 1. Therein it is at once evident that, except for the exaggerated growth near the base, maximum cross-sectional growth along the main stem of a tree of 0.1 live-crown ratio is at 10 percent of length from its tip; of 0.2 live-crown ratio, at 20 percent of its length. In short, cross-sectional growth is maximum at the base of the live crown.

In Figure 2 is presented the average contribution of the individual branch to the cross-sectional growth along the main stem. In the solution of the basic equation for these results, $n_P=1$, and D and N are, respectively, the location, and number of branchlets, of the individual branch. In each case, the equation was solved for several values of P from $P=D$, to $P=1$. A striking feature, apparent in Figure 2, is that certain branches may contribute nothing to the growth of the main stem; such as a branch with less than three branchlets that occurs in the lower half of tree length; or a branch with less than five branchlets, in the lowermost quarter of tree length.

The contribution of productive branches in the lower half of tree length is fairly evenly distributed between branch base and the point of root influence. But branches in the upper half, especially in the top quarter, contribute appreciably most growth at, and near, branch base.

Figure 3 shows the periodic annual contribution of a single branch to the entire growth of the main stem from branch-base to tree-stump, according to location of the branch. It is based upon the definite integral of the basic equation with respect to P, between a branch-base (where $P=D$) and tree-stump (where $P=1.0$). Into this equation there was inserted

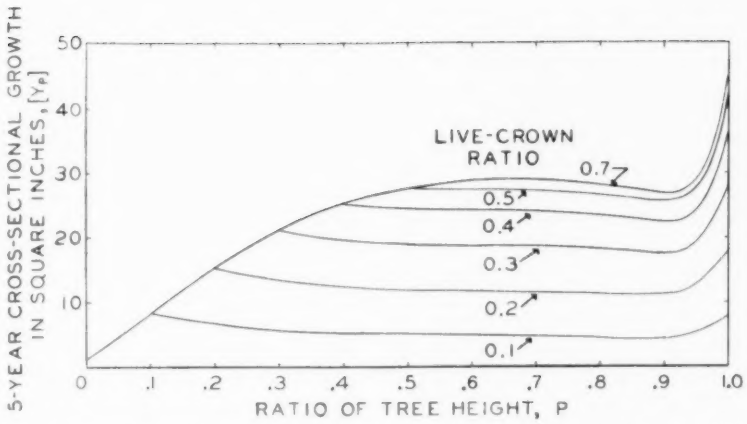

FIG. 1.—Cross sectional growth along the main stem provided by live crown ratios of 0.1 to 0.7 in loblolly pine.

TABLE 1.—ANALYSIS OF VARIANCE OF CROSS SECTIONAL GROWTH; AND TEST OF RESIDUAL TREATMENT-GROUP EFFECT

Source of variation	Degrees of freedom	Sum of squares	Mean squares
Among treatment groups	8	1.7024	0.2128[1]
Within treatment groups	66	3.3896	0.0514
Residuals from regression	74	5.0920	0.0688
Regression equation	6	56.4818	
Total, around general mean	80	61.5738	

[1]Highly significant.

TABLE 2.—SPECIFICATION OF THE AVERAGE TREE OF CROWN RATIO CLASS 90 AT END OF 1944

Section	P	Number of branches in section n	Number of branchlets in branch N	Branch base, mid point of section D	Average branch length L
Tip	0	1.0	0	0	0
	0.1	8.0	1.3	0.05	0.054
	.2	9.1	2.8	.15	.095
	.3	8.8	3.8	.25	.142
	.4	7.7	4.2	.35	.189
	.5	5.9	4.4	.45	.216
	.6	4.0	4.5	.55	.243
	.7	2.3	4.5	.65	.257
	.8	0.9	4.5	.75	.270
	.9	0	0	0	0
	1.0	0	0	0	0

for a branch at location D, the number of branchlets N, as given for the average tree in Table 2. Volume is expressed in cubic inches of growth per year for a tree of 50 feet in height. The figure demonstrates that a branch with 2.8 branchlets and located at 15 percent of tree length from its tip, contributes more to the volume growth of the main stem than does a branch with fewer branchlets, but higher in the crown; or one with more branchlets but lower on the bole. Thus the typical branch between 10 and 20 percent of tree length from tree tip is the highest producer of volume growth on the main stem.

Table 3 shows the total volume growth of the main stem as contributed by all of the tree's branches. The values therein were calculated from the planimetered area of the graph of each crown-ratio in Figure 1 separately for the sections within and below the crown. They are expressed as periodic annual growth in cubic feet for a 50-foot tree. It is evident therein, that maximum total volume growth (within and below the crown) is produced by the longest live-crown ratio. The purpose of artificial pruning, however, is to maximize growth of *clear* volume on the tree's bole, and this can occur only below the crown. It is the 0.4 crown-ratio that maximizes this clear volume to the tree, although the crown-ratio of 0.3 produces not very much less.

If number of trees per acre in an even-aged stand is inversely proportional to the square of branch-length (Table 2)—i.e., inversely proportional to the square of crown-radius—one judges that half of tree length, or a branch

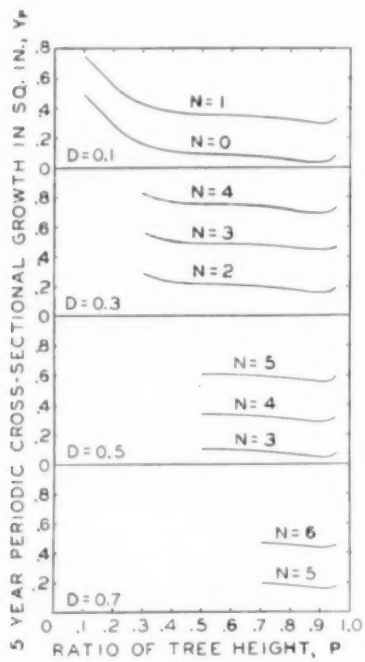

FIG. 2.—Cross sectional growth along the main stem contributed by the single branch of given location (D) and number of branchlets (N).

TABLE 3.—EFFECT OF LIVE-CROWN RATIO ON VOLUME GROWTH OF THE MAIN STEM

Live crown ratio	Periodic annual growth in cubic feet		
	Below crown	Within crown	Total
0.1	.027	.003	.030
.2	.055	.009	.064
.3	.076	.016	.092
.4	.085	.024	.109
.5	.080	.035	.115
.6	.069	.049	.118
.7	.052	.068	.120

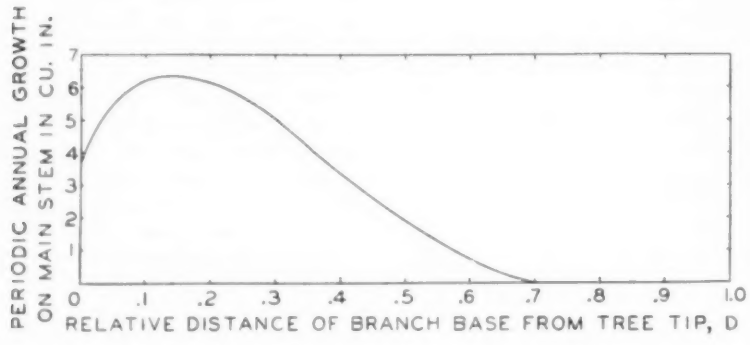

FIG. 3.—Periodic annual volume growth contributed by the single branch at location D to the main stem from branch base to tree stump of a 50-foot loblolly pine. Specification of the branch at each location is given in Table 2.

a stand of crown-ratio 0.3 can contain $(.189)^2/(.142)^2$ or 1.77 times as many trees as a stand of crown-ratio 0.4; and consequently, it can produce $(1.77)(.076)/(.085)$ or 1.58 times as much clear volume to the acre; and this, at a loss of only $1-(0.076)/(0.085)$ or 11 percent of clear-volume growth to the tree. It thus seems that the crown-ratio of 0.3 is the best compromise between maximum clear volume growth to the tree and to the acre.

According to Miscellaneous Publication 50, U. S. Department of Agriculture, the average height of dominant and codominant trees in a 25-year old loblolly pine stand of site index 85—an average site quality—is 55 feet. If fully-stocked, the stand should have 300 dominant and codominant trees containing 100 square feet of basal area per acre; and 295 trees in the lower crown classes with 42 square feet of basal area.

In the 20-30 year age class, the average crown-ratio of loblolly pine in a stand of closed canopy, is $8/\sqrt{N}$ approximately, where N is number of trees per acre. The average crown ratio of the stand described above should then be about 0.33; so that the pruning of a selected number of dominant trees, say 120, to a distance of 34 feet above ground—which is 62 per cent of tree length and the length of two full sawlogs—should reach into the live crown of only the occasional individual. Pruning in a fully-stocked stand should be accompanied by a rather severe thinning especially around the pruned trees so as to preclude their further natural pruning for some time.

In open stands, on the other hand, the pruning of longer-crowned individual dominants to the live-crown ratio of 0.3 implies the removal of a portion of live crown. The expected outcome is less growth in the butt log (Fig. 1); but the maintenance of growth at the base of the new crown should gradually change the form of the second log from the cone frustum to that approaching the cylinder.

Summary

Artificial pruning had been imposed in 1934 in an open, 15-year stand of loblolly pine, so as to leave live-crown-ratio classes of 10, 20, ..., 90 percent. Thirty pine trees were pruned in each of the nine classes. Second and third prunings were made on the same trees after the 1939 and 1944 seasons, respectively, so as to maintain the initially established crown ratios.

In an effort to find an expression of the 1945-49 cross-sectional area growth of the main stem at any point, in terms of crown description by individual branches, ten trees in each of the nine crown classes were felled during fall-winter of 1949-50. Each tree was sectioned into 10 equal lengths, subjected to stem analysis, measurement of individual branch location, length and number of branchlets, as of 1945. The stem analysis provided the 1945-49 cross-sectional-area growth of the 1945 tree on the nine sections below the top section.

Formulation of the problem leading to the form of the basic equation, and the organization of the field data so as to provide the solution of the basic equation are discussed, and the basic equation is given. Further results are the following:

1. There is no effect of the pruning treatments on the cross-sectional growth of the main stem that is not explained by the crown descriptions as used.

2. The distribution of cross-sectional-area growth of the main stem from tip to stump according to the live-crown ratios from 10 to 70 percent is presented graphically. Except for the flare near root-collar, growth is maximum at the base of crown and decreases somewhat toward the stump.

3. The average contribution of the single branch to the cross-sectional growth of the main stem is also presented graphically. It depends upon the location of the branch and the number of its branchlets. A branch in the top tenth of the tree contributes most to main-stem growth just below its base; while the production of lower branches is fairly evenly distributed along the stem.

4. A branch with less than three branchlets that occurs in the lower half of tree length, or a branch with less than five branchlets in the lowermost quarter of tree length, contributes nothing to the main stem.

5. Each portion of the crown is characterized by a branch of given length and number of branchlets. The branch that contributes maximum volume to the main stem is the typical branch located at 15 percent of tree length below tree tip.

6. The live-crown ratio of 0.4 produces maximum clear volume on the tree bole, while the live-ratio of 0.3 produces 89 percent as much.

Division of Silviculture Invites Papers

The preliminary program for the Division of Silviculture sessions at the 1954 annual meeting of the Society must be in the hands of the editor of the JOURNAL OF FORESTRY by June 15. There will be two half-day sessions of the Division, to be held at Milwaukee, Wisconsin, October 24-27. The afternoon session will be taken up by a panel discussion on either forest soils or the coordination of silvicultural objectives with wood-quality and species requirements in the forest industries.

We are now calling for titles of papers from which to select the program for the morning session on October 26. Papers are sought on any phase of silviculture proper from any part of the country. Papers may be on a subject of general interest or of a special appeal because of its unusualness. We hope that some will deal with Lake States and Central States silviculture; and we are especially anxious to get titles from the younger men, and those who have not been heard before. When finally prepared, papers should be short enough to be presented in 15 minutes or less—not more than 12 pages, double-spaced.

In order that we may select the program in time to notify the JOURNAL OF FORESTRY, please let us have your proposed titles — and tell us whether a slide or movie projector or other special equipment will be needed. Send the information, not later than May 15, to the chairman of the Division, Philip A. Briegleb, Southern Forest Experiment Station, 704 Lowich Building, New Orleans 13, Louisiana.

HENRY L. HANSEN,
Secretary.

Seasonal Variations in Bark-Peeling Characteristics of Some Adirondack Pulpwood Species[1]

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THE quantitative measurement of bark-peeling resistances is desirable for studying the natural peeling season of pulpwood species and for evaluating the effectiveness of chemical treatments made to induce bark separation. This paper describes a tool devised to measure the adherence of bark to wood and presents data on the natural peeling characteristics of the following eight species: red spruce, yellow birch, white birch, bigtooth aspen, white ash, beech, red maple and sugar maple.

Measurement of Bark-Peeling Resistance

The bark-testing tool[2] is composed of a number of separate elements which are used sequentially to obtain the desired measurement. Part of the tool is employed to saw a circular kerf through the bark, thus producing an isolated disc of undamaged bark which remains attached to the tree. Another portion of the tool is then utilized to grasp this bark disc, after which a force is applied to twist the bark loose from the wood. The applied force is measured by means of a spring balance. The wide range of bark resistances that are encountered makes it necessary to vary the size of the disc that is cut through the bark or to vary the lever distance at which the force is applied. To obtain comparative data of peeling resistance, it is necessary to calibrate the instrument for each combination of lever length and area of bark disc.

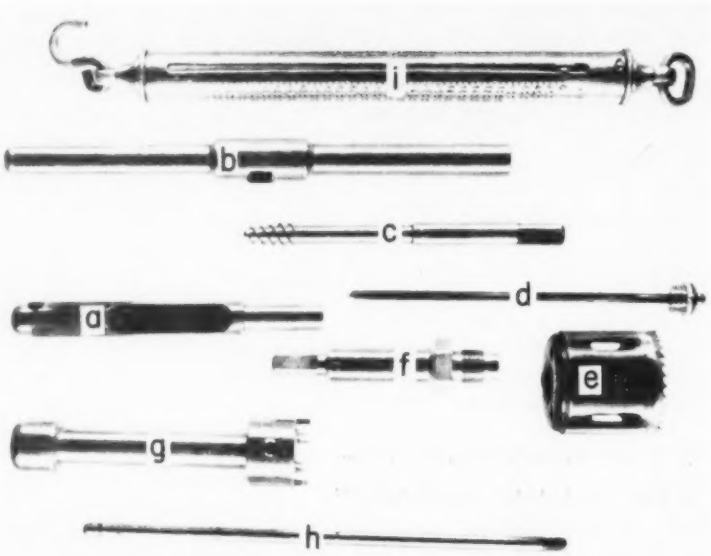

FIG. 1.—Components of the bark testing tool.

Figure 1 shows the various elements of the bark-testing tool. Figures 1, 2, and 3 are presented to aid in visualizing the construction and operation of the instrument. The various components (Fig. 1) consist of a bark punch (*a*) used to remove a small plug of bark; an increment borer consisting of handle (*b*), shaft (*c*), and extractor (*d*); a hole saw (*e*) with arbor (*f*); a peeling head (*g*) with torsion bar (*h*); and a metric spring balance (*i*). The function of each of these parts will be made clearer in the following discussion of operating procedure.

The first operation in using the tool is to remove a plug of bark with the bark punch (Fig. 1, *a*) to make a clearance hole for insertion of the increment borer. This clearance hole is necessary because the screw threads on the increment borer tend to lift the bark from the wood in an area around the borer. Next, the increment borer (Fig. 1, *a*, *b*, *c*) is centered in the hole and is screwed into the trunk until the shoulder of the borer shaft is flush with the trunk.

The hole-saw arbor (Fig. 1, *f*) with the hole saw (Fig. 1, *e*) is then placed on the protruding shaft of the increment borer, and using the increment borer handle, the hole saw is used to cut through the bark to the wood. The hole saw is then removed carefully to avoid tearing loose the bark disc. The portions of the tool utilized in this phase of the operation are shown in Figure 2.

Next, the torsion bar (Fig. 1, *h*) is screwed on the peeler head (Fig. 1, *g*) and the assembly is placed on the borer shaft with the torsion bar horizontal and to the right. The pins on the peeler head are forced into the bark, care being taken to avoid piercing the wood. The spring balance (Fig. 1, *i*) is then placed in the notch at the end of the torsion bar and a steady pull is exerted in a downward direction. The reading of the spring balance at the time of bark slippage is recorded as the peeling re-

[1]This work is sponsored by the Chemical Debarking Project, which is composed of the following companies: American Smelting and Refining Company, St. Regis Paper Company, Brown Company, Eastern Corporation, Eastern Pulpwood Company, P. H. Glatfelter Company, Hollingsworth and Whitney Company, International Paper Company, Oxford Paper Company, West Virginia Pulp and Paper Company, Marathon Corporation, Penobscot Development Company, Fraser Companies Limited, and Dead River Company.

[2]The first model of the bark testing tool was designed by one of the authors (Wilcox). The Sandvik Saw and Tool Company have made further developments, and it is their model that is described here.

sistance. Figure 3 shows the assembly consisting of increment borer shaft, peeler head, torsion bar, and spring balance for this last operation.

Bark Peeling Tests

Measurements of peeling resistances were made on the eight species of trees from April 16 to August 31, 1952. Each week from 4 to 6 trees of each species were tested and graphs were prepared using the average peeling resistance at each date. These peeling-resistance curves are shown in Figure 4.

The resistance to peeling was compared to hand-peeling conditions, and the best sap-peeling was determined to be at 2,000 grams or less (using a $1\frac{1}{4}$" hole saw for preparing the bark disc and a 6" lever for applying the force). Resistances above 5,000 grams were considered to indicate a condition of non-peeling. At values much above this, bark separation occurred in the outer layers of the bark and not in the cambial region as in normal peeling.

With the sampling intervals described above, the earliest date of peeling (below 5,000 grams) was noted on April 23 for red spruce, beech, and sugar maple; on April 29 for red maple, white birch, white ash, and bigtooth aspen; and on May 5 for yellow birch. The best peeling conditions (2,000 grams or less) were between the following dates for the indicated species:

Species	Dates	No. of Days
Bigtooth aspen	Apr. 29-Aug. 10	102
White ash	Apr. 29-Aug. 7	96
Red maple	May 4-Aug. 12	96
White birch	May 5-Aug. 7	93
Red spruce	Apr. 30-Aug. 2	92
Yellow birch	May 22-Aug. 7	76
Sugar maple	May 16-July 24	68
Beech	May 30-July 16	46

A comparison of the peeling-resistance curves in Figure 4 shows that in all the species, except ash, there is a relatively fast drop in resistance to peeling in late April and early May, this drop continuing until about June 15 or 20. After these dates, resistance to peeling increases, with the best sap-peeling (2,000 grams or less) terminating by August 10 to 12. White ash peeled consistently at about 1,200 grams throughout April, May, June, and July, with the resistance suddenly increasing early in August and reaching an average of 4 000 grams by August 15.

FIG. 2.—Portions of bark-testing tool used for preparing test disc in the bark.

To determine the relationship of peeling to cambial development, frequent samples were taken from the cambial region of two species, yellow birch and red spruce. Records were also kept of weather conditions throughout the period of investigation.

The relationship of the start of peeling (below 4,000 grams) to the mean weekly temperature is shown in Figure 5. The time interval indicated on the temperature curve (start of peeling) is the period within which all eight species first started to peel. It will be noticed that peeling first occurred shortly after the mean weekly temperature had passed 40°F. This onset of peeling preceded leafing-out by about 3 weeks and preceded the first cambial divisions by approximately a month. However, the anatomical investigations revealed that phloem reactivation occurs about the time that slippage begins. Once peeling had started, it was found to continue up to about a month after cessation of cambial activity. The interval of time of minimum peeling resistance (the troughs of the curves in Fig. 4) was found to correspond to the period in which the cambium is actively dividing. The period of maximum cambial activity is of short duration, about one month in red spruce and about six weeks for yellow birch. The relationships between the periods of peeling and cambial activity is shown in the following tabulation (compare with Fig. 4):

FIG. 3.—Portions of bark-testing tool for producing and recording bark peeling resistance of the test disc.

Red spruce

Peeling, April 23-September 1 (Below 5,000 grams).

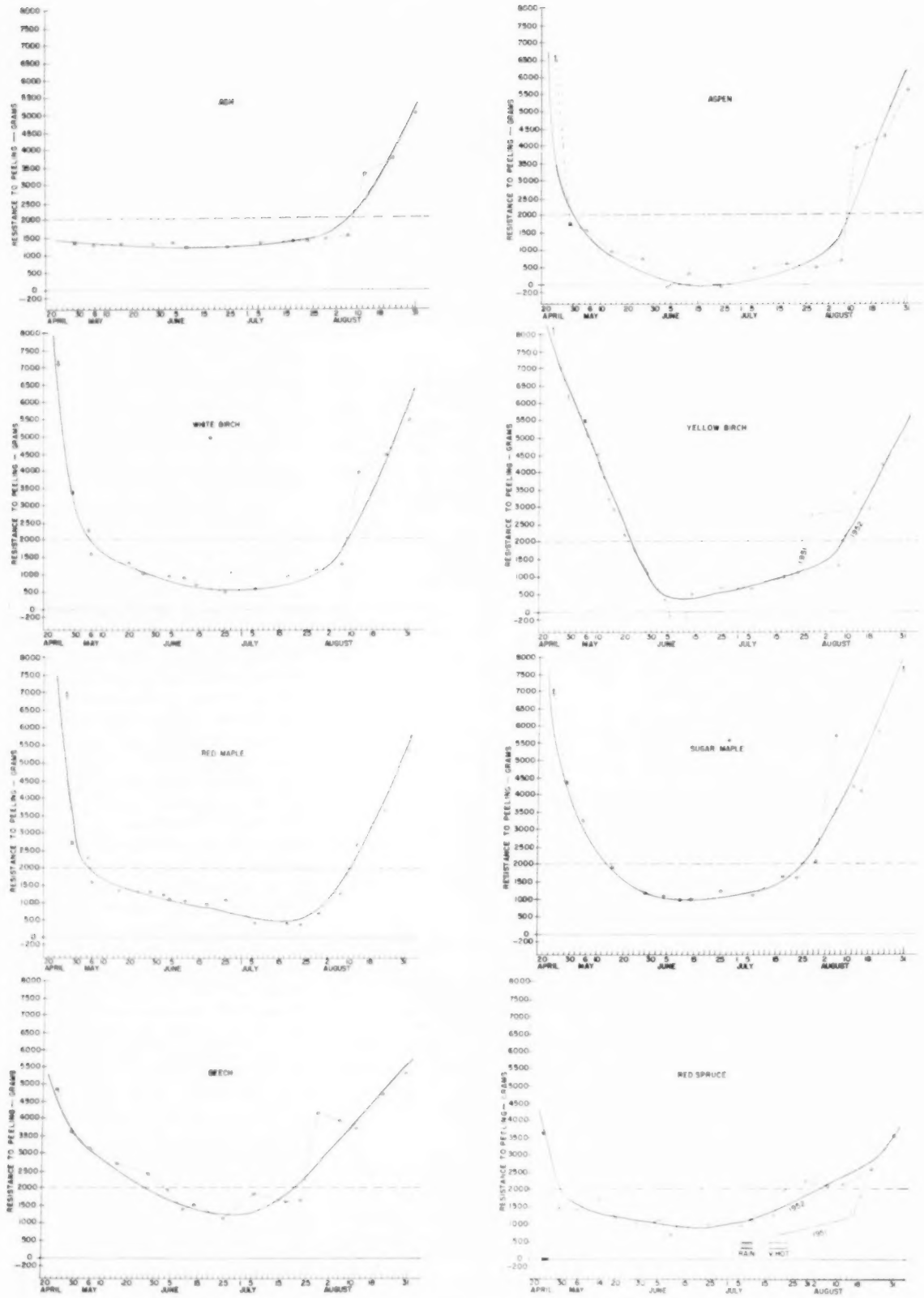

FIG. 4.—Curves of bark-peeling resistance for ash, bigtooth aspen, white birch, yellow birch, red maple, sugar maple, beech, and red spruce.

Sap-peeling, April 30-August 20 (Below 2,000 grams).

Cambial divisions, May 20-July 15 (few divisions after July 1).

Yellow birch

Peeling, May 5-August 22 (Below 5,000 grams).

Sap-peeling, May 22-August 8 (Below 2,000 grams).

Cambial divisions, June 1-August 1 (few divisions after July 15).

The increase in peeling resistance at the end of the season does not appear to be related to weather conditions. The peeling resistance of spruce was tested immediately before and after a 4-day period of rain in July ("rain" in the curve for red spruce, Fig. 4), after the average peeling resistance had already started to increase. Nevertheless, peeling resistance showed an increase during and following this period. The following 6 days were dry and had average temperatures with a daily maximum of about 72 F.; peeling resistance still continued to increase. The next 6 days were dry and very hot ("V. Hot" in the curve for red spruce, Fig. 4), with a daily maximum of about 86°F., and the resistance still continued to increase. A week of normal temperatures, with intermittent rain or showers followed, with the same gradual increase in resistance.

Discussion

Special notice should be taken of the marked lag between "softening" of the cambium (as evidenced by slippage) and divisions in the cambium. However, there is a period of phloem reactivation and maturation which becomes evident about the time slippage occurs. About three-quarters of the phloem produced during the previous season remains undifferentiated through the winter and undergoes maturation in the spring prior to the resumption of cambial activity. The bark slippage undoubtedly is induced by a hormonal mechanism which is associated with phloem reactivation prior to the initiation of cambial activity. The exact nature of the cell wall changes induced by the hormone is not certain. Two opposing suggestions have been made to account for the softening and elastic extension of cell walls. On the one hand, the softening has been attributed to changes in the hydration of the pectin gel within the cell wall (*6*). This hypothesis explains the properties of the primary wall on the basis of a continuous pectic phase and a discontinuous phase of cellulose microfibrils. On the other hand, the softening has been attributed to a loosening of the heteropolar points of attachment in a cell-wall lattice composed of continuous cellulose microfibrils (*1*, *5*).

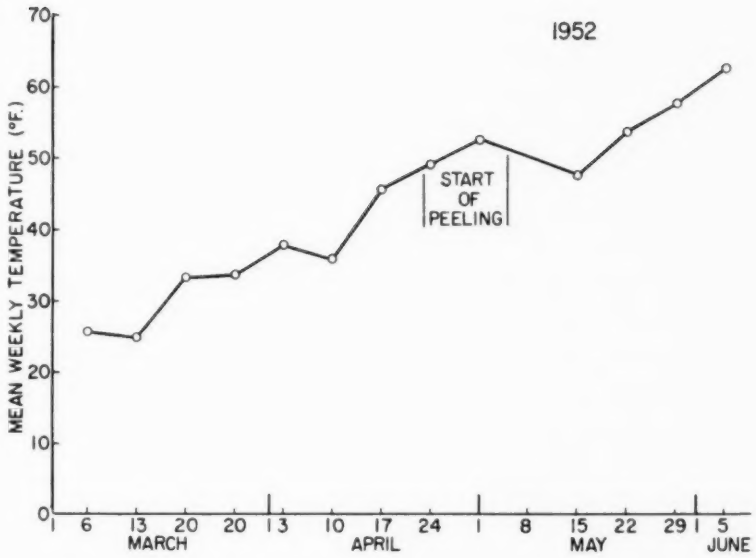

FIG. 5.—Relationship of start of peeling to mean weekly temperatures.

The early start of peeling, which occurs considerably ahead of cambial divisions, has been discussed in detail by Hüber (*2*, *3*, *4*). He found that peeling first starts at the top of the tree and progresses downward at the rate of about one meter per day. He postulated a wave of hormones moving down the trunk from the crown, and cited his experiments with girdling as supporting evidence for the hormone flow (*3*). In these girdling experiments, he found that the ease of peeling decreased beneath the ring, while above the ring, peeling was increased and prolonged, presumably because of the damming of the hormone.

It is significant that cambial divisions (which occur a month after peeling first commences) also occur first in the upper portions of a tree and later at successively lower levels. The cambial divisions first occur at the bases of the bursting buds and are associated with a production of hormone by the "elongation growth". The relation of this later hormone stimulus to apical growth was indicated in yellow birch by the fact that cambial divisions occurred at breast height from a week to ten days after the buds opened, which, in relation to Hüber's (*4*) studies, corresponds to the length of time necessary for the stimulus to move downward from the buds.

There are several plausible explanations for these relationships between peeling, bud expansion, and cambial divisions. A few of these are: (1) A single hormone is involved, but the first production of hormone is only sufficient in quantity to cause bark peeling but insufficient in quantity for cambial divisions. The later and larger quantity of hormone produced during the opening of the buds results in cambial divisions. The first quantity of hormone could result either from relatively minor growth developments in the bud, resulting in concomitant cambial softening and phloem reactivation, or could be produced autonomously in the phloem during its reactiva-

tion. If the hormone is produced locally in the phloem, the phloem itself could be stimulated by the favorable air temperature, the effect first being noticeable higher in the tree where the insulating effect of the bark is at its lowest. (2) A single hormone is involved, but the delay between peeling and cambial divisions may be due to the time required for a sequence of locally-occurring events which culminates in cambial divisions. (3) There are two hormones involved, the first resulting in cambial expansion and the second in cambial divisions. Again, the first hormone could result either from minor changes in the buds or from autonomous changes in the phloem. The idea of an autonomous hormone production being responsible for the early cambial softening is supported by Hüber's later work (4) which shows bark peeling does occur below a girdle in trees ringed early in the growing period even though the normal supply of hormone from the crown is interrupted.

Peeling which occurs late in the season, after the cessation of cambial divisions, can be explained more satisfactorily than the early slippage prior to cambial activity. It has already been pointed out that the time of minimum peeling resistance corresponds to the period of active cambial divisions. During this stage, the addition of new cells to the xylem proceeds considerably in advance of their differentiation and maturation and there is a wide layer of cells with weak walls that are easily ruptured. However, maturation slowly continues centrifugally in the xylem for a month or more after cambial divisions have ceased. Thus, the number of layers of immature cells gradually decreases until all are matured through the summerwood to the inner surface of the inactive cambium. During this time, the peeling resistance is slowly rising. Upon the completion of maturation, the peeling resistance greatly increases and the bark no longer peels. The walls of cambial initials have also hardened into their dormant condition so that the cambium itself is resistant to rupturing. It remains for another wave of hormone the following spring to cause a softening of the cambial zone and re-initiate the whole process.

Summary

1. A tool which measures bark-peeling resistances has been devised for study of peeling during the natural peeling season of tree species and for evaluating the effectiveness of chemical treatments to induce bark separation.

2. The natural peeling period has been determined for large-toothed aspen, ash, red maple, white birch, yellow birch, sugar maple, beech, and spruce.

3. The beginning and end of peeling is not related in any way to any readily visible feature of the tree.

4. There is little difference between the various species, except ash, in the time that peeling starts. Ash started to peel before April 16, but the other seven species all started to peel between April 23 and May 5.

5. There is a probable relationship between the start of peeling and the mean weekly temperature. Peeling occurred shortly after the mean weekly temperature had risen above 40°F.

6. The onset of peeling of hardwoods preceded the leafing-out by about three weeks and preceded the first cambial divisions by approximately a month.

7. Although cambial divisions are not required for peeling, they do further contribute to the ease of peeling once they occur. The period of maximum cambial activity is of short duration about one month in red spruce and about six weeks for yellow birch.

8. Peeling continues for about a month after divisions in the cambium have ceased. During this time there is a gradual increase in peeling resistance due to the maturation of newly-formed cells. Then end of peeling is unrelated to weather conditions.

9. A possible hormonal mechanism for peeling is discussed.

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Watershed Management Problems in the Central Rocky Mountain Region[1]

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FROM THE BLACK HILLS to the Mesaverde country, the Central Rocky Mountain area is a region of striking contrasts. As a visitor approaches from the East he is impressed with vast expanses of undulating grassland, where the plains run gently upward toward the Rockies. He first sees the mountains as a fine line of silver floating above the horizon. As he comes closer, little by little the details appear. Above arid, brushy foothills he sees long, dark bands of timber: piñon and juniper at the lower elevations, and then the ponderosa pine which clothes the Black Hills and most of the Front Range of Colorado. This is a grassland area too—in the piñon and ponderosa pine types, range vegetation is a dominant feature of the landscape. Above these sunny hillsides lie the denser blankets of lodgepole pine, spruce, and fir, whose cold forests reach on up the mountainsides to timberline. Beyond this line are the grassland, rock, and snow which make up the major ridges and peaks of the Central Rockies.

So this region looks today; and so it looked more than six generations ago, when Major Long led an exploring expedition up the South Platte River to the Rockies. Coming from Nebraska across the plains, Long's party first explored the South Platte canyon for a little way, but then turned south along the foothills; crossed Fountain Creek at Manitou Springs; and proceeded south to the Arkansas River. Because those people needed water and forage just as we do, they encountered the typical watershed and range problems of this western country. As they came up the South Platte from Nebraska they were impressed by the sparse vegetation, which showed many signs of overgrazing by buffalo, antelope, and other animals. Along the foothills, the effect of these conditions was expressed in flashy runoff from summer thunderstorms. When Fountain Creek was in flood, the water was so full of sand, gravel, and buffalo dung that it was quite unusable. Interestingly, however, the South Platte River inside the mountains was found to be well-controlled, and lined with grassy meadows, willows, and cottonwoods—quite a contrast to the waste of sandbars that forms the river valley today. But in those days the mountains were covered with uneut forest, and the range vegetation was probably not overgrazed by the native game.

As white men entered the region, conditions began to change. First came hunters and trappers, who drastically altered the game population; then gold and silver miners invaded the mountains. Aside from their excavations, they built villages and towns; these needed wood for their houses and fires, and livestock, as well as game, for their food. As the villages grew into cities, the forests of the lower Front Range were cut over repeatedly, until nothing was left but unmerchantable material. Along with heavy grazing by domestic livestock, this exploitation of the Front Range forests reached its climax in the late nineteenth century. By that time people had concentrated their settlements along the foothills and in the fertile valleys of the major streams leading out from all the mountain masses. There has been a continuous pressure ever since for all the products of forest and range watersheds. In the South Platte country, for example, forest products that are harvested range from kinnikinnick and Christmas wreaths and trees, to fence posts, poles, and sawtimber; and livestock grazing remains an important component in regional agriculture.

This intensive use has had an obvious impact upon watershed conditions. All through the lower Front Range, the original topsoil is gone. In many places the bare roots of antique stumps show that, since the mining days, six inches to a foot or more of soil has been washed away into the stream channels below. The South Platte and its tributaries now bear testimony to this erosion by thousands of sandbars.

During this same period the bison vanished from the plains, and antelope and other game were decimated. But their effect on the short-grass range and on watershed conditions was perpetuated by vast herds of domestic cattle that were established on ranches throughout eastern Colorado and Wyoming. Thus the ancient characteristics of the plains country have been maintained: grama and buffalo grass and prickly-pear cactus; and gravelly streams that are either dry or running in flashy, debris-loaded floods.

Somewhat later than mining, timber cutting, and grazing came the growth of irrigation agriculture in the Rocky Mountain region. Through the late nineteenth century, green irrigated fields spread out over river valleys and adjacent land; until now all these farms together form one of the richest areas of irrigation agriculture in the West. At the same time, they built up an intense demand for water: by now, practically every drop of water in the rivers east of the Continental Divide is appropriated for human use. In the North Platte River watershed of Wyoming, legal rights have been established to even the highest floods. And water is being imported from the western slope through several trans-mountain diversions.

Thus the intensive development of water supplies led the valley people to a full realization of the great value of clear water from their mountain streams. But for some reason they failed to realize the relation of these water yields to the use and condition of water-

[1]Paper delivered at the general meeting, 53rd annual meeting, S.A.F., Colorado Springs, Colo., Sept., 1953.
[2]Formerly Chief, Division of Forest and Range Influences, Forest Service, U.S.D.A., Washington, D.C.

shed land. Even with floods, water shortages, and sedimentation becoming more acute, the exploitation of mountain resources and deterioration of watershed land might have continued unbated up to now.

Even in recent years, favorable prices and high demands for lumber, meat, and wool have led to unremitting pressures for increased timber harvesting and use of mountain rangelands. Such pressures are felt by private and public land managers alike. The livestock operator, forest landowner, or lumberman is naturally tempted to cash in while prices are good, and to take all possible products off his land. Correspondingly, he urges the custodian of public lands to grant more timber sales, and to permit more livestock on the public range. To the manager of public lands, this problem is greatly complicated by the intermixture of private and public ownership of land throughout the Rocky Mountain region. Throughout the national forests, long stringers of valley land and often alternate sections of mountain land are in private ownership. This frequently means marginal economic units for private management, intensified pressure for the use of public lands, and difficult administrative problems.

During the past generation, however, improvements in land management on both public and private watersheds have begun to counteract the trends of deterioration. These improvements began in response to the same widespread sentiments for watershed protection which laid the foundation for the establishment of national forests. As pointed out repeatedly by an outspoken group of Americans, the exploitation of watershed land for wood and forage has generally caused damage to water supplies, as well as to the future productivity of the land. Accordingly, the people interested in good watershed conditions—agricultural and industrial water users, city dwellers, sportsmen, and naturalists—have repeatedly expressed their demand for better watershed management. Also, a number of cities such as Colorado Springs have placed vital watershed land under protection so as to safeguard their water supplies.

Thus there have developed two strongly opposing viewpoints: one favoring watershed protection, the other exploitation. With the passage of time, watershed land managers have come to realize that neither group may be entirely right. Logical analysis would indicate that, while complete exploitation of land resources is almost universally bad, complete protection may not always be good. In most cases it has seemed likely that some use of land resources such as forage and wood may be permissible, without causing any serious damage to watershed conditions or water supplies. These thoughts lead to the largest single problem that must face any watershed land manager. For any given tract, how much and what kind of use is permissible?

Because land managers themselves could not easily develop the solutions to these problems, there came a need for research on forest and range problems, including watershed management. This kind of research was started quite early in the Rocky Mountain region. Under the guidance of Carlos Bates, a watershed experiment was conducted by the Forest Service and Weather Bureau from 1909 to 1926 at Wagon Wheel Gap, Colorado. While this experiment was in progress, other research was started at the Fremont Experiment Station above Colorado Springs. Here Bates and Roeser of the Forest Service developed a volume of knowledge about Rocky Mountain forests. And the Wagon Wheel Gap experiment provided an early demonstration that, on high-altitude watershed lands of the Rocky Mountains, severe disturbance of the forest cover may be permissible without appreciably damaging watershed conditions.

In response to a growing demand for knowledge, in 1935 this earlier research was considerably expanded with establishment of the Rocky Mountain Forest and Range Experiment Station at Fort Collins, Colorado. This station has concentrated especially on range, forest, and watershed management. Although the problems facing its research men have been far greater than they could attack with available finances, they have already built up a stock of useful information to guide the management of watershed land in the Rocky Mountain region.

The Situation Today

Up to this point our discussion has dealt with the past; but where do we stand today? What does the watershed land manager have to work with now? Are his lands generally in good shape? Does he have the scientific tools to restore them, or to maintain their good condition? And what are the major problems ahead of him?

As background, let us summarize what the past has given him to work with. First, except for the less accessible lodgepole pine and spruce-fir forests of the upper elevations, logging and overgrazing have left the region in more or less deteriorated condition. Second, the rebuilding of this land is made more complicated by the intricate pattern of land ownership. And finally, the land manager's problem is not simplified by having to deal with just one resource. Instead he has to consider a multiplicity of watershed uses, assigning proper weights to them: water, recreation and wildlife, forage, and wood

With this background, what are the present problems of the watershed land manager? Although the knowledge accumulated from past experience and research is not yet adequate to provide all the answers to this question, at least we can suggest the direction in which the land manager may go in approaching the solution of his problems. For clarity, these suggestions will be grouped into several broad categories of land, separated on the basis of their relative capacity to tolerate the uses of watershed resources. Under each category will be indicated its general characteristics and present condition, and then the general kind of management that is required.

High-Altitude Forest and Range Lands

These are the alpine ranges and the forests of lodgepole pine, Engelmann spruce, and subalpine fir that occupy the land above about 7,000 feet in Wyoming, and 9,000 feet in Colorado. This zone includes one of the coldest climates in the United States; while summer thunder showers are common, most of the precipitation occurs in the form of snow. Hydrologically, the climate is gentle; rates of water application to the soil are relatively slow. Because of these conditions, erosion hazards are small, even though some of the soils would be classified as erodible.

Up to now the exploitation of these areas has been relatively slight. In parts of Wyoming and Colorado, considerable areas of lodgepole pine have been cut over. Only in recent years, however, have timber cutting operations moved systematically into the lodgepole pine and spruce-fir forests. Thus it can be said that present watershed conditions are generally good, and that the risk of damage from the use of forest and range resources is low. In fact, research results obtained in this zone indicate that the harvesting of timber may be expected to produce definite benefits by increasing water yields. Experiments being conducted at the Fraser Experimental Forest, west of the Continental Divide in Colorado, showed that heavy cutting of mature lodgepole pine made more than 30 percent additional water available for streamflow. Comparable results were obtained in studies of mature spruce-fir forests and in young lodgepole pine. These results are being given further tests in a watershed experiment at Fraser.

These facts indicate that well-planned use of forest resources in this zone should be encouraged. In general, even rather severe timber cutting is not likely to upset natural conditions so far as to cause progressive deterioration rather than recovery. The principal precautions that have to be observed in this area have to do with methods of logging and with road relocation and construction. Even in stable watersheds, the construction of roads and skid trails creates a profound disturbance. Where logging roads traverse a watershed, they cut across many natural courses that water takes on its way underground to the streams. Then the water, instead of moving slowly through the soil, takes a much faster course down the roads and roadside ditches. Aside from causing the slumping of cuts and erosion of roads, ditches, and culverts, this short-circuited drainage of the watershed causes flashier streamflow, with higher, muddier peak discharges. Exactly this phenomenon is being observed at the Fraser Experimental Forest, where a network of logging roads has been introduced into an experimental watershed. Therefore the location and construction of logging roads and skid trails should be done with extreme care. Also, we need to investigate alternative methods of logging, which would require less roads than are used at present.

The Ponderosa Pine-Grassland Zone

This area, including the Black Hills as well as most of the Front Range in Colorado and southern Wyoming, is strikingly different in character from the high-altitude zone. The ponderosa pine forests are open and sunny, carpeted with grass, and interspersed with broad valleys and meadows. The climate is more open, too, with less snow than at higher elevations. In the Front Range, summer thunderstorms often produce higher peak discharges and more water in the streams than comes from winter snows. In fact, high-intensity summer storms are a major cause of the comparatively high erosion hazards in this zone.

Because of their accessibility, these forest and range lands have been exposed to heavy use since the mining days. Over large areas, the present cover is a scrubby stand of second-growth pine, with sparse bunch-grass underneath. Much of the topsoil is gone, meadows and hillsides are lined with gullies, and the typical stream is lined with sandbars from end to end.

This sounds bad, and it is. Obviously the principal job of the land manager in this zone is watershed stabilization and the recovery of productive capacity in terms of wood and grass. Even though water yields of this zone are exceedingly important, they are comparatively small in quantity. In contrast to the yields of 12 to 24 inches of water from the high-altitude forests, these areas produce from about three to seven or eight inches of water per year. Accordingly, efforts in watershed management are not generally pointed at increasing yields, but rather at improving the quality of the water supplies and reducing sediment production.

At the same time, the land manager is faced with heavy demands for the wood and forage produced in these mountain areas. Therefore he has to make the maximum use of these resources, at the same time aiding deteriorated lands to recover as rapidly as possible. In some places conservative grazing or timber cutting may be permissible. Wherever necessary, the revegetation of depleted land with trees, shrubs, or grass helps accelerate the stabilization of land and the recovery of productive capacity. But regardless of the demand for wood and grass, in other places complete protection from use is required. Examples are steep southerly and westerly slopes in granitic soil, where any appreciable disturbance causes damage.

As in the high- altitude zones, roads and skid trails present special hazards. Here the damage is caused primarily by excessive exposure of soil to the impact of intense rains, rather than by the accelerated drainage of subsurface watercourses. Therefore the smallest possible mileage of roads and skid trails should be constructed, using sound designs, and cuts and fills should be revegetated wherever possible. Work by the Rocky Mountain Forest and Range Experiment Station, the Bureau of Public Roads, and others has pointed the way to good practices in road construction and protection.

Dwarfmistletoe Control in Southwestern

Lake S. Gill and

The Grass-Woodland Foothills

From many viewpoints this is the most difficult problem area in the region. It lies between the mountains and the plains, where water is scarce and the normal production of wood and grass is low. Summer thunderstorms are frequent and intense: turbulent movement of air currents is fostered by the steeply rising canyons and mountain slopes. Topography, geology, and soils are strikingly complex. Since this belt of land lies along the edge of the great mountain upthrusts, it is characterized by steeply tilted layers of sedimentary rocks, grading into twisted metamorphics, then into the igneous formations of the main range. This means variety in productive capacity of the land, in the erosion hazards of soils, and in the steepness and exposure of slopes.

Present watershed conditions are generally poor. Even more than the ponderosa pine belt, the foothill lands have been severely exposed to overgrazing and overcutting of timber. Much of the land is now covered with cheatgrass; the hillsides are eroded, and almost every stream channel is choked with gravel and sand. Hence this area faces even worse problems of rehabilitation than the ponderosa pine areas. Because most of the land is in private ownership, it presents special problems of administration and organization. It is to be sincerely hoped that, as in many areas in the United States, the local people themselves will begin to take the initiative in improving this watershed land. Especially where city dwellers or groups of water users are affected, concerted action may be arranged through the formation of watershed associations, with assistance from the state and federal governments where necessary.

The Great Plains

This great region of short-grass vegetation must have been overgrazed at the time of Major Long's exploration. Over the intervening years the dominant use has changed from bison to domestic cattle. Perhaps land conditions have improved. At present they are highly variable, depending on the efficiency of ranch management as well as on soil and other natural factors. Badly deteriorated range land is interspersed with areas in very good condition. In fact, it is possible in places to come across "square soil types" where good range conditions apparently end at the boundaries of a single owner's property. In general, however, the aspect of this region has probably not changed greatly, and much work remains to achieve good range and watershed conditions throughout the region. Even with the best of management, this will still be an area of extremely low water yields, but flashy streamflow with frequent floods from summer thundershowers. This means that good range management and revegetation commonly need to be supplemented by mechanical work, including small reservoirs, to reduce floods by temporary storage. In such work, however, great caution is needed to avoid serious conflict with established water rights. In Wyoming, for example, studies have shown that a network of stock reservoirs in the Cheyenne River basin causes surprisingly large losses of water from the total yield in this river.[3] As soil and moisture conservation work is conducted throughout this region and the foothills of Colorado and Wyoming, close cooperation will need to be maintained with state engineers and the holders of water rights, so that an equitable solution to mutual problems can be reached.

Conclusion

In this brief review of watershed and range problems, an attempt has been made to show the significant features of the Rocky Mountain region, and the kind of job that lies before the land manager in handling forest and range watershed resources. This is a colorful and interesting region, with a rich background of history. But that history has left us today with many problems. In high-altitude forests the land manager needs to work toward maximum yields of wood and water, for the use of valley people. In most of the ponderosa pine country, his problem is to rebuild the productivity of forest and range land, so as to provide watershed stability coupled with reasonable production of wood and forage. And in the foothills and Great Plains, the problem is to minimize floods and erosion by revegetation and wise land management, coupled with necessary engineering work. Through cooperative work by public land managers and private owners, the aim will be to produce maximum supplies of wood, forage, and clean water for the people of a growing region.

[3]Culler, R. C. and H. V. Peterson. Effect of stock reservoirs on runoff in the Cheyenne River Basin above Angostura Dam. Geological Survey Circular #223, 1953.

Dwarfmistletoe Control in Southwestern Ponderosa Pine Forests under Management

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THE DWARFMISTLETOE[2] attacking *Pinus ponderosa* var. *scopulorum* Engelm. in the southern Rocky Mountains and Southwestern states is *Arceuthobium vaginatum* forma *cryptopodum* (Engelm.) Gill *(1)*. It is distinct from and more aggressive than *A. campylopodum* forma *typicum* (Engelm.) Gill which is found on ponderosa pine *(Pinus ponderosa* Laws.) to the west and north. The increased aggressiveness may be due in part to the nature of the dwarfmistletoe species, to greater susceptibility of the *scopulorum* variety of ponderosa pine, and to the arid climate of the region which is favorable to a number of mistletoe species. In any event, the situation in ponderosa pine is considerably more acute in the Southwest than elsewhere within its range.

With few exceptions, dwarfmistletoe control in the ponderosa pine forests of the Southwest has been limited to sanitation measures which could be taken on timber sales without reducing residual volumes prescribed for normal healthy stands. Such measures have perhaps been partially effective in protecting very lightly infected stands but their value is doubtful where the parasite has become well established *(2)*. In certain localities dwarfmistletoe is responsible for heavy losses *(2, 3)* and in some cases seems to have favored invasion of the ponderosa pine type by woodland type or other species. The fact that some moderate to heavily infected stands have given fair yields might cause one to assume that future yields of the same quantity and quality can be expected without applying special control measures. On the contrary, if one considers the insidious agressiveness of this parasite it is more likely that once it has built up a large population within a stand, its effect will be progressively detrimental on future yields and will lead eventually to complete loss unless it is reduced to a negligible factor in the residual growing stock. Where dwarfmistletoe is abundant on virtually nonproductive areas there is often a tendency to regard the site as being incapable of growing merchantable trees. In view of the fact that this pest must become established initially on fairly vigorous hosts in order to develop and perpetuate itself, it seems more likely that in such cases one is actually witnessing the ultimate in destruction by the parasite. General observations in Arizona and New Mexico indicate that dwarfmistletoe is most abundant on ridge or mesa sites characteristic of open, but nevertheless merchantable, stands yielding 10,000 ft. b.m. per acre or more. It is common on slopes, less common in bottoms, and extremely rare on submarginal sites outside the commercial range of ponderosa pine.

At present, the only feasible method of control is to cut or kill infected trees or prune infected branches. In managed forests this would be done in conjunction with harvest cuttings, intermediate cuttings, or timber stand improvement operations. Limited tests with chemical and biological control agents have not proven to be effective as yet.

Dwarfmistletoe spreads by means of seeds which are shot from explosive fruits. When the seeds alight on susceptible parts of a suitable host they may establish new mistletoe plants. According to Weir *(5)* the youngest growth is by far the most likely place for infection, and growth over 2 years old is immune. The authors' observations agree with those of Weir to the extent that young growth is most susceptible to infection. Following germination, the primary root of dwarfmistletoe may remain alive and grow on the surface of pine stems for as long as a year before it invades the bark of the host. Weir *(6)* also found that 3 to 5 years may elapse between infection and maturation of the first fruits of several species of *Arceuthobium* in the Northwest. Incomplete observations by the authors indicate that in the case of *A. vaginatum* f. *cryptopodum* the minimum period between infection and production of the first flowers is 33 months. An additional 15 months is needed for the female flowers to mature their seed, making a total of 4 years as the minimum time required to complete the life cycle. Most dwarfmistletoe plants will take even longer to develop; and there is indirect evidence that some may not produce their first shoots before 13 years. Furthermore, it is not uncommon for the parasite to develop shoots for several years and then lapse into an extended period of lateney during which the shoots die and are not replaced with new ones. In such cases the absorbing system continues to advance and the shoots, which are produced at the termination of the latent period, appear at some distance from the original point of infection on the host.

Since 1933 a number of experiments dealing with the control of

[1]Maintained by the Forest Service, U.S. Dept. Agric., with headquarters at Colorado A. & M. College. Others who contributed to the work described here include Don E. Ellis and Theo. R. Moberg, pathologists with the former Division of Forest Pathology, Bur. of Plant Industry, Soils, and Agricultural Engineering, Stuart R. Andrews and Paul C. Lightle, forest pathologists at the Rocky Mountain and California Forest & Range Experiment Stations, respectively.

[2]The name "mistletoe" refers to the European genus *Viscum*, while our so-called mistletoes all belong to other genera. The principles of nomenclature adopted by the American Joint Committee on Horticultural Nomenclature and the U. S. Forest Service require, under the circumstances, a prefix combined or hyphenated with the word "mistletoe" in order to distinguish the North American plants. For this reason the name "dwarfmistletoe" has been used in this paper in lieu of the more familiar "dwarf mistletoe".

in the subsequent 13-year period the counts on the extensive plot the first year (1934) on the two

TABLE 1.—BASIC STAND DATA FOR INTENSIVE PLOTS HI-1 AND HI-2 COMBINED

	Merchantable trees 11.6 in. d.b.h. and over				Large poles 7.6-11.5" d.b.h.		Small poles 3.6-7.5" d.b.h.		Saplings 3.5" d.b.h. and under	
	No. of trees		Gross vol. bd. ft.		No. of trees		No. of trees		No. of trees	
	Per acre	Pct. 1933	Per acre	Pct. 1933	Per acre	Pct. 1933	Per acre	Pct. 1933	Per acre	Pct. 1933
Original stand 1933[1]	17.6	100	7260	100	40	100	183	100	201	100
Not infected but cut in 1933[1]	1.5	8.5	660	9.1	1	2.5	15	8.2	44	21.9
Cut 1933 account mistletoe[1]	14.6	83.0	5610	77.3	13	32.5	51	27.9	30	14.9
Cut 1938 account mistletoe[1]	0	0	—	0	6	15.0	20	10.9	8	4.0
Remaining 1938[1]	1.5	8.5	990	13.6	20	50.0	97	53.0	119	59.2
Mortality 1934-1949[2]	0.7	4.0	560	7.7	0	0	1	0.6	17	8.5
Remaining 1950[2]	17.6	100	1460	20.1	60	150.0	103	56.3	40	19.9

[1]D.b.h. as of 1933.
[2]D.b.h. as of 1950.

ponderosa pine dwarfmistletoe (*A. vaginatum* f. *cryptopodum*) have been in progress at the Fort Valley Experimental Forest near Flagstaff, Ariz.[3] Most of these experiments are of the continuing type, but an interim analysis made in the fall of 1950 and spring of 1951 has brought out certain information that may be useful in planning and conducting future mistletoe control programs in heavily infected ponderosa pine stands.

The Unit 1 Study[4]

The first study provided an 18-year record on a 19½-acre experimental area in a heavily infected, uneven-aged, virgin stand of pure ponderosa pine from which all visible mistletoe was removed in 1933.

A 100-foot wide isolation strip was established around the experimental area from which mistletoe was removed in 1933 and 1938. Within the isolation strip, three plots were established for record purposes as follows: (1) An extensive plot (HE) of 10.875 acres on which individual records were kept only for mistletoe-infected trees subsequent to 1933, (2) Two intensive plots (HI-1 and 2) of 1.0 and 0.375 acres, respectively, on which complete individual tree records were kept in 1933 and subsequently.

Annual re-examinations of all plots were made from 1934 to 1938, inclusive, during which time all infections found on the intensive plots were cut upon discovery. Those found on the extensive plot were noted and left in place until 1938, when all visible mistletoe was again removed. The plots were re-examined in 1950-51.

The effect of mistletoe control on the stand.—In the case of the extensive plot it is estimated that the initial cut removed more than 70 percent of the volume in order to eliminate mistletoe from the overstory. A more complete appraisal for the intensive plots is given in Table 1, which shows that 77.3 percent of the merchantable volume and about 30 percent of the poles were removed in 1933 because of mistletoe. During the 5-year period from 1933 to 1938, when mistletoe was destroyed annually, it was unnecessary to cut any merchantable trees, although 11 to 15 percent of the poles were eliminated because of nonprunable infections. Following mistletoe removal in 1938, the residual volume was 990 ft. b.m. per acre in merchantable trees while the poles and saplings numbered 236 per acre.

No mistletoe was removed after 1938. After deducting mortality between 1934 and 1950 and adding ingrowth for the same period, the intensive plots had a merchantable volume of 1,460 ft. b.m. and a population of 203 poles and saplings per acre. In the 12 years since 1938 the number of merchantable stems per acre increased from 1.5 to 17.6, the large poles from 20 to 60, and the small poles from 97 to 103, while the saplings decreased from 119 to 40. There have been no good reproduction years during the period of the experiment and, in addition, much of the young growth that was established has been severely damaged by deer.

In 1950 the stand per acre on the extensive plot was as follows: merchantable stems 14.5, large poles 29.8, small poles 40.8, and saplings 1.4. While the stem count was considerably less on the large area than on the intensive plots, the volume on the extensive plot in 1950 was 2,440 ft. b.m. per acre, or 980 ft. b.m. more than on the intensive plots, which were selected because they illustrated a mistletoe problem in good reproduction and therefore had less merchantable volume initially.

Effect of control on mistletoe recurrence.—In terms of the total number of infections developing in the 18-year period 1934-1951 on trees living in 1951, 40 to 60 percent appeared in the first five years (Table 2). The treatments subsequent to 1933 materially reduced the average annual appearance of the parasite between 1939 and 1951. The effects were more beneficial on the intensive plots where the mistletoe concentration had been heaviest. Here 63 percent of the infections developed in the first five years (12.6 percent per year), whereas 37 percent (2.8 percent per year) developed

[3]These experiments were established and maintained by the Div. of Forest Pathology in cooperation with the Southwestern Region and the former Southwestern Forest and Range Experiment Station of the U. S. Forest Service.

[4]This study was initiated by Ira J. Hatfield, formerly assistant pathologist, Div. of Forest Pathology, B.P.I.S.A.E., at Albuquerque, N. Mex. It is located in Unit 1 of the Fort Valley Experimental Forest.

This study indicates that com-

in the subsequent 13-year period 1939-1951.

In an effort to determine the approximate date of origin of mistletoe that appeared subsequent to the control operations, more than 300 infections on the experimental area were examined in 1951. The age of the stemwood on which mistletoe shoots had first developed was determined for each case. The results of the analyses, given in Table 3, indicate that half of the infections found in 1951 were present but invisible during the control operations of 1933 and 1938. The other fifty percent have developed from seed produced by those infections.

During the five-year period following control in 1933 the mistletoe population developed to 17 percent of the 1933 pre-control population. This rapid recurrence is due primarily to the development of latent infections present but invisible at the time of the operation. During the subsequent period from 1939 to 1951 when no control was practiced the mistletoe population reached 7 percent of the original before treatment in 1933. Of the infections present in 1951 approximately half had become established before 1938 and half since 1939 (Table 3). Figure 1 shows the development of mistletoe in each of the five years following initial control in 1933 on both the intensive and extensive plots. In both cases a peak was reached the third year (1936), after which there is a downward trend, suggesting that over 60 percent (63 to 77 percent) of the infections to appear in the 5-year period are visible during the first three years. The very marked downward trend for the last two years (1937 and 1938) in the case of the intensive plots may very well be explained by the fact that mistletoe was cut out annually and the population therefore represents only latent infections present before control. The extensive plot, on the other hand, received no treatment during the 5-year period so that the 1937 and 1938 populations would be slightly complicated by infections originating since 1933. Furthermore, the counts on the extensive plot were made from the ground, whereas on the intensive plots the trees were climbed. This could easily explain the discrepancy in the percentage of infections found the first year (1934) on the two areas, and would tend to increase the populations recorded for succeeding years on the extensive plot as the mistletoe shoots became more conspicuous.

TABLE 2.—RECURRENCE OF MISTLETOE FOLLOWING CONTROL IN 1933 AND 1938

Plot	Mistletoe infections during period 1934-1938			Mistletoe infections during period 1939-1951		
	Number	Percent 1934-1951	Percent Av. annual	Number	Percent 1934-1951	Percent Av. annual
Intensive (HI-1 & 2)	117[1]	63	12.6	69[3]	37	2.8
Extensive (HE)	268[2]	41	8.2	383[3]	59	4.5

[1]Infections cut out annually 1934-1938, inclusive.
[2]Infections cut out in 1938 only.
[3]Infections alive in 1951.

TABLE 3.—PERIODS OF ORIGIN OF MISTLETOE INFECTIONS DEVELOPING ON THE EXTENSIVE PLOT SINCE 1933

Age of pine growth		Period of most probable infection[1]	Percent of total infections 1934-1951
Oldest	Youngest		
Not determined	1932	1934 or earlier	34[2]
1933	1938	1933 to 1940	16[3]
1939	1951	1939 to 1951	50[4]

[1]Assumes infection occurred on current to 2-year-old growth.
[2]Most infections must have originated in 1933 or earlier since seed source was negligible in 1934 immediately following initial control.
[3]Most infections must have originated between 1933 and 1938 as seed source was negligible in 1939 and 1940 following second control operation.
[4]All infections originated after second control operation in 1938.

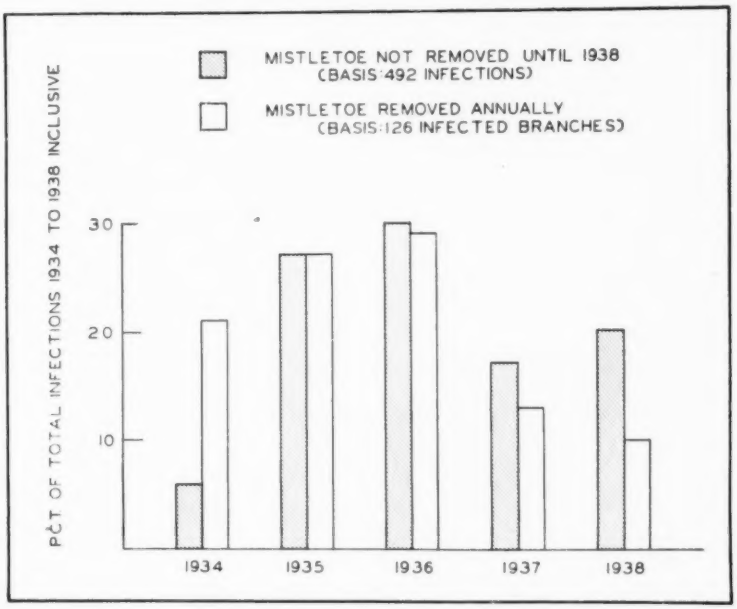

FIG. 1.—Bar diagram showing the development of mistletoe on the intensive and extensive plots, respectively, during the first five years after control in 1933. In the case of the intensive plots, mistletoe was cut out annually, whereas on the extensive plot it was not disturbed during the 5-year period.

ments, observations, and treat-

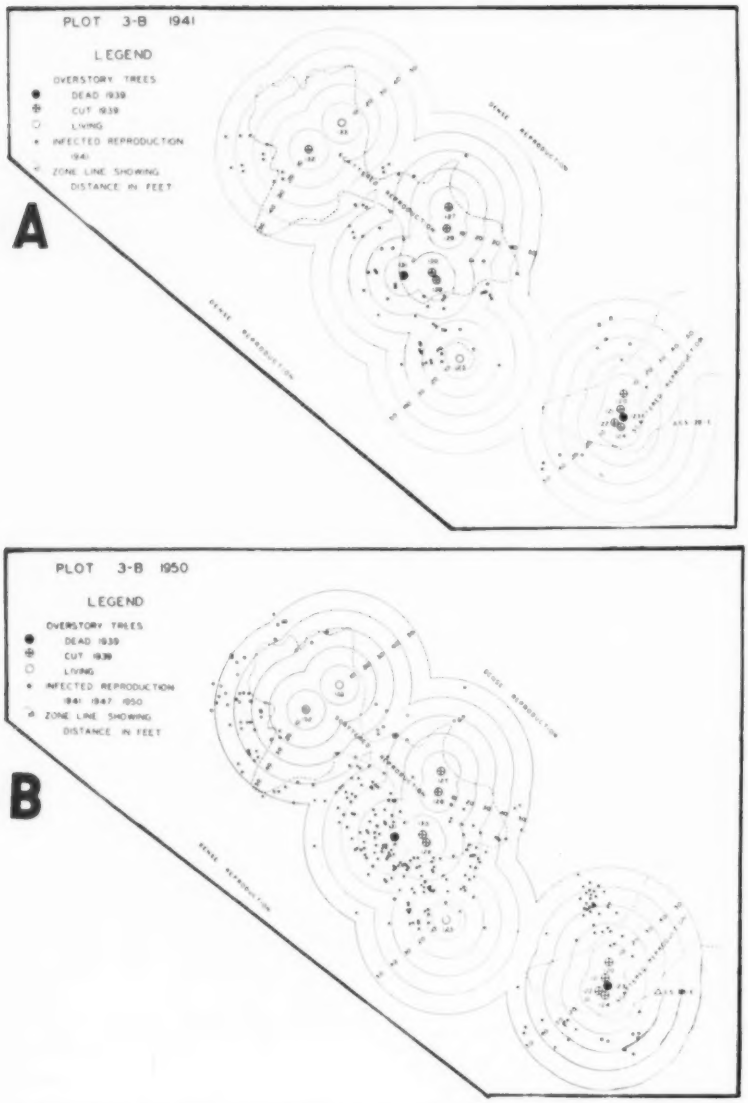

FIG. 2.—*A*. Pattern of infected seedlings found in 1941 while infected overstory was present. *B*. Pattern in 1950 with no infected overstory present. Over 90 percent of the increase represents the appearance of infections established but not visible while the overstory was present.

This study indicates that complete eradication would require persistent attrition over a long period of years, even where there was no problem of invasion from the outside. In managed forests such a procedure would be impractical and, fortunately, is unnecessary. The main objective is, through proper understanding of mistletoe behavior, to obtain a spacing of control operations that will reduce the mistletoe population to a negligible factor during the next cutting cycle.

Distribution of Mistletoe Infections After Control Operations

In 1951, 16 percent of the trees on the extensive plot were infected. Seventy-eight percent of the infected trees supported one or more infections originating before 1933. As indicated in Table 4, about half (49.5 percent) had been infected and pruned in 1938 and most of them (72.5 percent) had only 1 to 3 mistletoe plants. At the other extreme, 7.3 percent heavily infected (15 to 30 infections per tree), and 35.5 percent of all the mistletoe was concentrated on this small group, most of which had been infected prior to pruning in 1938.

The Wing Mountain Study

In 1939, a 67-acre tract in the Wing Mountain Unit of the Fort Valley Experimental Forest was set aside for additional mistletoe control studies. This area is inside a 480-acre block of pure ponderosa pine which was first cut over in 1909 and relogged in 1939 under principles outlined by Pearson and Wadsworth.[4] Initial measure-

TABLE 4.—DISTRIBUTION OF INFECTIONS LIVING IN 1951—EXTENSIVE PLOT

Number of infections per tree	Infections in 1951						Infected Trees in 1951						Nominal degree of infection
	On trees pruned 1938		On trees healthy 1938		Total		On trees pruned 1938		On trees healthy 1938		Total		
	No.	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*	
1 - 3	52	13.6	56	14.6	108	28.2	35	32.1	44	40.4	79	72.5	Light
4 - 14	75	19.6	64	16.7	139	36.3	12	11.0	10	9.2	22	20.2	Medium
15 - 30	108	28.2	28	7.3	136	35.5	7	6.4	1	0.9	8	7.3	Heavy
All	235	61.4	148	38.6	383	100.0	54	49.5	55	50.5	109	100.0	All

ments, observations, and treatments were completed on the mistletoe area in 1941 so that the plots provide essentially a 10-year record after the 1950 reexamination. So far as current results are concerned, this experiment is indicative of mistletoe behavior in young even-aged reproduction that had been exposed to a heavy barrage of mistletoe seed for its entire life of 20 years (1919-1939) when the overstory infections were removed.

The overstory infection centers were observed and recorded in 1939 and were removed by logging operations the same year; a few minor cases were overlooked and were not destroyed until 1941. The locations of the overstory trees and infected seedlings in the area were mapped in 1941. Locations of infected seedlings were subsequently entered on these maps in 1947 and 1950. With the bole of each infected overstory tree as a center, concentric circles were drawn on the maps to represent 10-foot zones on the ground. A typical infection center pattern used in the following analyses is shown in Figure 2. Figure 3 illustrates the character of the reproduction.

The infection pattern for all centers was similar to the one shown in Figure 2 in that most of the infected seedlings were 20 to 40 feet from infected overstory trees and very few were more than 60 feet. Figure 4 shows the frequency of occurrence of infected seedlings observed during the past decade in relation to the distance from overstory trees. In deriving the curve the bole of the overstory tree was assumed to be the center of the infection, or zero point; actually, this was seldom the case. Most of the mistletoe seed was produced at or near the periphery of the crown, 10 to 15 feet out from the bole. The curve, therefore, gives an exaggerated expression of the explosive force of the seed. The actual model range, instead of being about 25 feet, as indicated in Figure 4, is probably more nearly 15 feet. The scattered infection pattern in the reproduction strongly suggests that the directional influence of wind was not important.

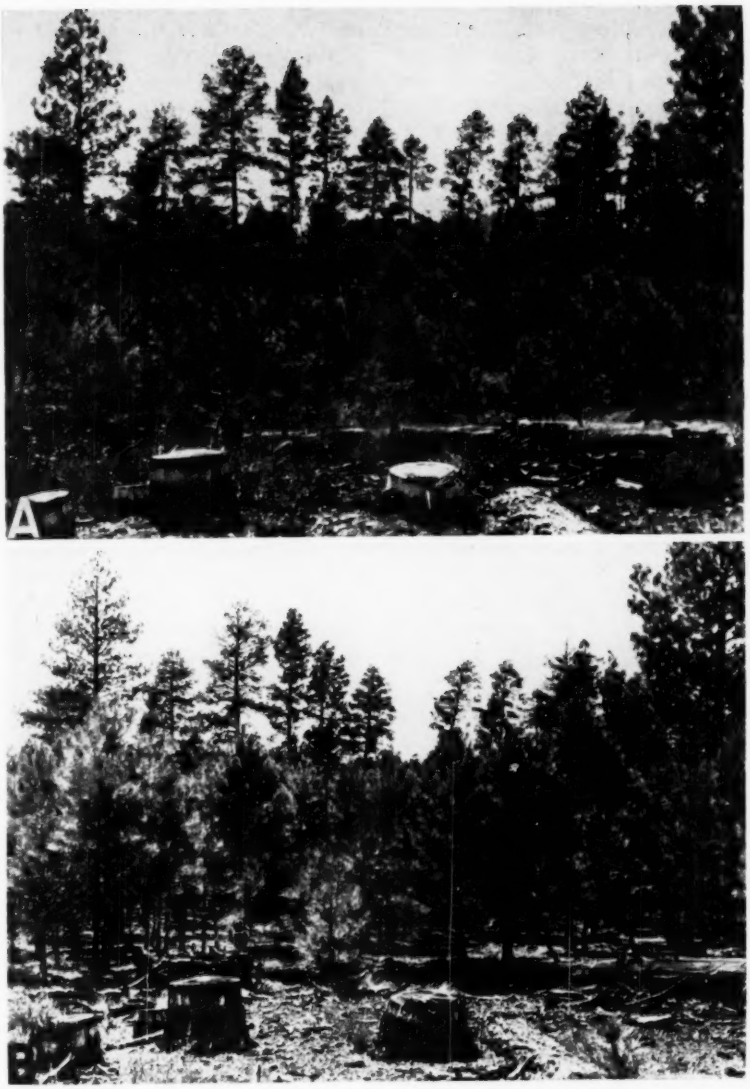

FIG. 3.—*A*. Photograph of the infection center shown in Figure 2 after removal of the overstory in 1941. *B*. Same as *A*, in 1950.

Table 5 shows the population of infected seedlings at each examination of the infection centers. The trend is similar to the one shown in Table 2 in that a high percentage of the pre-established mistletoe plants appear within five or six years after the infection source has been removed.

In 1951, a study of 1,149 infected seedlings was made in parts of the Wing Mountain area where,

TABLE 5.—APPEARANCE OF MISTLETOE IN YOUNG EVEN-AGED REPRODUCTION FOLLOWING REMOVAL OF INFECTED OVERSTORY IN 1939

Year of observation	Age of seedlings	No. of infected seedlings (cumulative)	Percent of 10-year total
1941	22	528	27
1947	28	1552	79
1950	31	1954	100

A minimum of 48 months was found to elapse between infec-

go a prolonged period of latency defies complete eradication of the

1941 to 1950, 27 percent were ap-

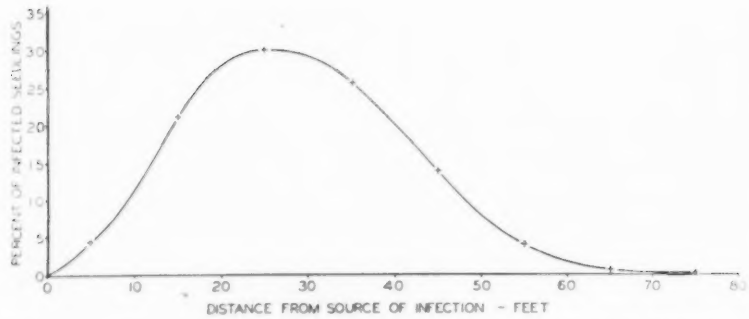

FIG. 4.—Frequency curve showing abundance of infected seedlings in relation to distance from infected overstory trees. (Basis: 1954 seedlings.)

TABLE 6.—EFFECTIVENESS OF PRUNING IN REDUCING MISTLETOE INFECTIONS (INTENSIVE PLOTS HI-1 AND 2)

	Trees living in 1951						
		Percent infected			Percent healthy		
	Total No.	Never pruned	Pruned '33 or '38	Total	Never pruned	Pruned '33 or '38	Total
Merchantable	24	5	12	17	37	46	83
Large poles	82	4	11	15	60	25	85
Small poles	142	2	6	8	75	17	92
Saplings	55	0	2	2	82	16	98
Total	303	2	7	9	70	21	91

in 1940, mistletoe had been removed from both overstory and reproduction and where subsequently it had been allowed to develop without further interference. This revealed that 93 percent of the mistletoe infections originated on pine growth of 1940 or earlier, i.e., most of them were established before the overstory was removed; a negligible number may have originated in 1941 or 1942, although the seed source would have been very small at that time. Approximately 7 percent of the seedlings, then, had become infected from their neighbors in a decade. On the other hand, about 19 percent of the individual infections originated after 1940, which illustrates the tendency for mistletoe to intensify on the same trees once they become infected.

Suggested Application

The results based on these interim observations must be regarded as indicative rather than conclusive, although they suggest certain practical aspects of mistletoe control, which might be taken into consideration pending a résumé of the studies several years hence.

In many-aged stands, which are the rule in the best timber-producing ponderosa pine forests of the Southwest, heavy mistletoe infections can be effectively reduced by harvest cuttings that remove infected trees, followed by one or more control operations in the residual stand. In the case of the Unit 1 study, such an initial treatment followed by a second mistletoe reduction operation 5 years later has, after 18 years, reduced the mistletoe population to about 7 percent of the original. The actual damage and hazard today is considerably less, since the infections 18 years ago were in the main older and more prolific. Secondary cleanings are essential, to eliminate latent mistletoe plants, i.e., those that were established before the initial treatment that develop subsequently. Up to 60 percent of these latent infections should appear within 5 years after the original control operation and about 80 percent after 7 years. In the case of the Unit 1 study, the rate of appearance was most rapid during the three years following the initial treatment. Presumably, then, the most effective timing for a secondary mistletoe reduction operation would be between three and seven years after the initial control work.

Pruning is an expensive measure that should be practiced only when it can be fully justified for economic or silvicultural reasons. The efficacy of pruning on the intensive plots of the Unit 1 study is shown in Table 6. Of 221 trees per acre living in 1951, approximately 62 were pruned in either 1933 or 1938. By 1951 about 15 (24 percent) were still infected. If all pruned trees had, instead, been poisoned or cut, the number of residual stems per acre would have been reduced from 221 to 159, or a loss of 28 percent. On the other hand, the infected trees would have been 4.4 per acre instead of 19.9, a reduction of 78 percent or perhaps more, since infection in unpruned trees must have originated in part from those that were pruned and subsequently developed mistletoe.

Where a heavily infected mature stand overshadows young dense even-aged reproduction, only those seedlings within 60 feet of an infected tree are in a hazardous position. After the overstory infection is removed, spread within young even-aged stands is slow. No attempt need be made to remove mistletoe from dense reproduction for at least 10 years and perhaps longer in order to give latent infections ample time to become perceptible and to permit a treatment that will incorporate good silvicultural practices along with pathological considerations.

Summary

Interim results are given on continuing studies of dwarfmistletoe, *Arceuthobium vaginatum* forma *cryptopodum* (Engelm.) Gill, on *Pinus ponderosa* var. *scopulorum* (Laws.) Engelm., in progress since 1933 at Fort Valley Experimental Forest near Flagstaff, Ariz.

Statistics from Schools of Forestry for 1953:

Gordon D. Marckworth

A minimum of 48 months was found to elapse between infection and production of the first seeds.

In 1933 and again in 1938 all visible dwarfmistletoe was cut out on a 19½-acre tract of uneven-aged pine. The two operations resulted in the removal of 86.4 percent of the merchantable volume and about 50 percent of the pole-sized stems. After 17 years the volume was 20.1 percent and the pole stems were 73.1 percent of the original before control in 1933.

In the case of two small plots from which dwarfmistletoe was cut out annually for the first 5 years, the plants that developed during the period amounted to 17 percent of the original before treatment. Most of these infections were latent and therefore invisible at the time of the first operation. In the subsequent 13 years during which dwarfmistletoe was not disturbed, the population reached 7 percent of the original and only half of it could be attributed to seed that had developed since 1938. The fact that some dwarfmistletoe plants undergo a prolonged period of latency defies complete eradication of the parasite for practical purposes.

Of the dwarfmistletoe plants developing on the 19½ acres between 1934 and 1938, over 60 percent appeared in the first 3 years.

In 1951, 16 percent of the trees on the 19½ acres supported dwarfmistletoe shoots. Of these, 78 percent had one or more infections that were latent in 1933; 72.5 percent were lightly infected (1 to 3 mistletoe plants per tree) and 7.3 percent bore 15 to 30 infections per tree; 35.5 percent of all the dwarfmistletoe plants were in this small group.

Studies are reported of dwarfmistletoe behavior in 20- to 30-year-old dense even-aged reproduction that had developed beneath a heavily infected canopy removed in 1939. Most of the infected reproduction was within 60 feet of overstory trees that had borne dwarfmistletoe shoots. Infection patterns in the reproduction suggest that wind was not important in the spread of the parasite. Of 1,954 infected seedlings that developed mistletoe from 1941 to 1950, 27 percent were apparent the first year, and 79 percent the sixth year. Only 7 percent of the seedlings had become infected from their neighbors in the decade, the remaining 93 percent were infected from the original canopy. However, 19 percent of the individual infections originated after the overstory had been removed, thus illustrating the tendency for dwarfmistletoe to intensify on a tree after attacking it.

Suggestions for control are given.

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TABLE 2.—BACHELOR DEGREES GRANTED FOR COMPLETION OF STUDIES IN SPECIALIZED FIELDS AT SCHOOLS OF FORESTRY IN THE UNITED STATES—CALENDAR YEARS 1952 AND 1953

Statistics from Schools of Forestry for 1953: Degrees Granted and Enrollments

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This article is another in a series of comparable papers appearing annually in the Journal of Forestry since 1934, reporting the enrollment at the schools of forestry and the numbers of degrees conferred. Statistics of this type were first assembled when the Forest Education Inquiry made its study in 1929-1931, and were published in the Inquiry's report in 1932.[1] *The annual articles in the Journal have brought to date the figures for each successive year.*[2]

FOR SOME TIME there has been a feeling among those using the statistics on the schools of forestry in the United States that, because of new developments the method employed in presenting the statistics did not present a true picture of enrollments and degrees granted as they exist today. While in the past the schools had comparable curricula, all looking toward the management of the forest, today many of these same schools offer curricula in other areas. For a number of years a few schools have offered specialized curricula in range management, in wildlife management, and/or in recreation. Within the past decade, an increasing number of schools have offered curricula in wood technology and utilization. In most of these schools the curricula followed a similar pattern, as had been the case in range management and wildlife management. In order to include this changing picture the statistics for 1953 have been broken down into five broad classes: i.e. general forestry; wood technology and utilization; range management; wildlife management; and forest recreation. Those curricula falling outside of these broad classes have been grouped under the heading *Others.*

In order that there may be a common understanding of the curricula included in the various classes some statement relative to the first two should be made. The statistics grouped together under the heading of *General Forestry* cover those phases of forestry dealing with the growing and harvesting of forest crops. The primary emphasis is placed on the production of the crop and the management of the forest land. Not included are such specialized curricula as "conservation." In the graduate field are included specialization in the fields of forest soils, silviculture, mensuration, protection, economics, valuation, and regulation. Since logging is a phase of harvesting, it has been included under this heading. The specialized curricula in "Forest Engineering" at Oregon State College and in "Logging Engineering" at the University of Washington have been included here rather than under *Wood Technology and Utilization.* This was done since in general they add specialized courses in engineering (both civil and mechanical) to the basic curricula in the "growing and harvesting of forest crops."

The statistics grouped together under the heading of *Wood Technology and Utilization* cover those phases which, though tied into general forestry, are concerned primarily with the wood itself and its utilization. Students following these curricula are exposed to courses in the growing and harvesting of trees but only in order to get a better understanding of the structure and uses of wood. Not included are specialized courses in chemical utilization, plastics, pulp and paper manufacturing, furniture manufacturing, packaging and similar curricula. These courses are grouped under *Others.*

Range Management, Wildlife Management, and *Forest Recreation* are terms which should be self-explanatory. In the current compilation there has been included under the heading *Others* curricula in Conservation Education, Rural Land Use Planning, Soil Conservation, Light Construction and Lumber Merchandising, Forest Chemistry, Pulp and Paper, and Plastics.

The veteran of World War II no longer presents a problem, so a detailed analysis of the veteran and non-veteran enrollment has not been included this year. Since the Korean veterans are being absorbed gradually, they do not present the same problems encountered in the period from 1946 through 1950, and no accounting has been made of their enrollment.

The only other change in the statistics is the inclusion among the non-accredited schools of the University of the South which is located at Sewanee, Tennessee.

Degrees Granted

During the calendar year 1953 the 35 schools of forestry awarded an estimated 1,027 undergraduate degrees, 155 master's degrees and

TABLE 1.—SIGNIFICANT STATISTICS FOR 1949 THRU 1953

	1949	1950	1951	1952	1953
Bachelor's degrees conferred	1,443	2,321	1,564	1,267	1,027
Master's degrees conferred	205	275	267	226	155
Doctor's degrees conferred	12	29	21	25	27
Undergraduates enrolled	7,469	5,935	4,799	4,691	4,909
Members of freshman class	1,485	1,442	1,370	1,536	1,698
Members of sophomore class	1,667	1,379	1,107	1,012	1,168
Members of junior class	1,816	1,384	1,053	1,013	917
Members of senior class	2,501	1,730	1,269	1,130	1,126
Graduate students—master's	450	483	344	281	349
Graduate students—doctor's	98	118	137	130	139

[1]Graves, H. S. and C. H. Guise. Forest education. Yale Univ. Press, New Haven. 1932.

[2]Guise, C. H. (Eighteen articles on degrees granted and enrollments at schools of forestry in the United States, 1934-1948). Jour. Forestry 32:337-343; 33:402-405; 34:114-120; 35:77-83; 36:12-18; 37:197-202; 38:241-246; 39:359-364; 40:196-202; 41:87-91; 42:357-360; 43:172-175; 44:110-114; 45:174-180; 46:168-173; 47:93-100; 48:165-169; 49:7-12.

Marckworth, Gordon D. Jour. Forestry 50:262-265; 51:256-259.

TABLE 2.—BACHELOR DEGREES GRANTED FOR COMPLETION OF STUDIES IN SPECIALIZED FIELDS AT SCHOOLS OF FORESTRY IN THE UNITED STATES—CALENDAR YEARS 1952 AND 1953

Accredited schools	General forestry		Wood technology		Range management		Wildlife management		Forest recreation		Others		Total	
	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953
1. Alabama	11	8	1	2	....	....	....	....	....	....	....	....	12	10
2. California	65	43	....	....	....	....	....	....	....	....	....	....	65	43
3. Colorado	14	12	4	3	9	9	11	10	7	8	....	....	45	42
4. Duke	....	....	....	....	....	....	....	....	....	....	....	....	....	....
5. Florida	26	16	....	....	....	....	3	3	....	....	....	....	29	19
6. Georgia	34	25	....	....	....	....	....	....	....	....	....	....	34	25
7. Idaho	18	30	4	2	10	9	....	1	....	....	....	....	32	42
8. Iowa •	51	32	....	....	....	....	....	....	....	....	....	....	51	32
9. Louisiana	21	7	3	3	....	....	2	3	....	....	....	....	26	13
10. Maine	24	27	....	....	....	....	6	9	....	....	....	....	30	36
11. Massachusetts	8	6	....	....	....	....	7	10	....	....	....	....	15	16
12. Michigan State	37	20	11	8	....	....	18	12	15	8	38	26	119	74
13. Michigan Univ.	52	40	8	10	....	....	2	1	....	....	2	1	64	52
14. Minnesota	39	35	10	4	....	....	....	....	....	....	....	....	49	39
15. Missouri	24	11	....	....	....	....	....	....	....	....	....	....	24	11
16. Montana	31	27	8	....	....	7	1	....	....	....	....	....	40	34
17. New York	55	61	49	24	....	....	....	....	13	10	18	12	135	107
18. North Carolina	29	20	5	11	....	....	....	....	....	....	....	....	34	31
19. Oregon	50	43	9	9	....	....	....	....	....	....	....	....	59	52
20. Pennsylvania	60	67	13	1	....	....	....	....	....	....	....	....	73	68
21. Purdue	34	21	7	3	....	....	....	....	....	....	....	....	41	24
22. Utah	14	10	....	....	11	8	17	11	....	....	....	....	42	29
23. Washington Univ.	33	38	11	12	....	....	....	....	....	....	....	....	44	50
24. West Virginia	25	17	1	....	....	....	6	6	....	....	....	....	32	23
25. Yale	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Total	755	616	144	92	30	33	73	66	35	26	58	39	1,095	872
Schools not accredited														
1. Arkansas	7	10	....	....	....	....	....	....	....	....	....	....	7	10
2. Connecticut	6	8	....	....	....	....	4	4	....	....	....	....	10	12
3. La. Poly. Inst.	13	12	....	....	....	....	....	....	....	....	....	....	13	12
4. Mich. Mining	27	27	....	....	....	....	....	....	....	....	....	....	27	27
5. New Hampshire	21	9	....	....	....	....	....	....	....	....	....	....	21	9
6. Oklahoma	22	27	....	....	....	....	....	....	....	....	....	....	22	27
7. Texas (S. F. Austin)	7	7	....	....	....	....	....	....	....	....	....	....	7	7
8. Univ. of the South	2	1	....	....	....	....	....	....	....	....	....	....	2	1
9. Virginia Poly. Inst.	16	16	....	....	....	....	14	4	....	....	....	....	30	20
10. Washington State	18	18	....	....	....	....	15	12	....	....	....	....	33	30
Total	139	135	....	....	....	....	33	20	....	....	....	....	172	155
Grand total	894	751	144	92	30	33	106	86	35	26	58	39	1,267	1,027

27 doctor's degrees. Of the 1,027 undergraduate degrees, 872 or 85 percent were awarded by accredited schools compared to 1,095 or 86 percent in 1952.[3] All told, there were 240 less undergraduate degrees reported for 1953 than for 1952. Since both the senior and junior classes this year show a decrease over 1952, a further decline can be expected during the next two years. (See Table 1.)

Looking at a breakdown of the undergraduate degrees in the specialized fields, we find that 73 percent, or 751 of the 1,027 degrees, were granted in the field of *General Forestry*. This compares closely to the 71 percent granted in 1952. (See Table 2.) *Wood Technology and Utilization* ranked second with 9 percent, followed closely by *Wildlife Management* with 8 percent. Thus these three fields accounted for 90 percent of the graduates. In 1953 only four schools — Colorado, Idaho, Montana, and Utah — graduated students majoring in *Range Management*, while only three schools—Colorado, Michigan State, and New York—graduated majors in *Forest Recreation*.

The number of master's degrees conferred in 1953 showed a decline of slightly over 31 percent over 1952, dropping from 226 to 155. Comparing the 1953 figures with the all-time high of 275 in 1950, there is a drop of nearly 44 percent. Looking at a breakdown of the 1952 and 1953 statistics we find that *General Forestry* accounted for approximately half of the degrees granted each year (52 percent in 1952 and 49 percent in 1953). As in the undergraduate area, *Wildlife Management* and *Wood Technology and Utilization* are the two important secondary fields of specialization totaling 24 and 12 percent, respectively. (See Table 3.)

The number of doctor's degrees granted in 1953 shows an increase of 2 over 1952, increasing from 25 to 27. An analysis of the records for the past five years shows that there has been no significant change in the number of doctor's degrees conferred during that period (Table 1). Duke (8), Michigan (7), and New York (5) granted 20 of the 27 doctor's degrees in 1953, and in 1952 Michigan (7), New York (5), and Washington (4) granted 16 of the 25 awarded that year. A breakdown of the 1953 statistics shows that 20 of the 27 degrees, or 74

[3]There is a slight difference between the number of degrees granted in 1952 as reported here compared to those reported last year. This is due to corrected totals supplied by some of the reporting schools.

TABLE 5.—ENROLLMENT BY CLASSES AT SCHOOLS OF FORESTRY IN THE UNITED STATES

dates in *Range Management* and

TABLE 3.—MASTER DEGREES GRANTED FOR COMPLETION OF STUDIES IN SPECIALIZED FIELDS AT SCHOOLS OF FORESTRY IN THE UNITED STATES—CALENDAR YEARS 1952 AND 1953

Accredited schools	General forestry		Wood technology		Range management		Wildlife management		Forest recreation		Others		Total	
	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953
1. Alabama		1												1
2. California	6	7			1	1	6	3					7	4
3. Colorado													26	6
4. Duke	14	3	12	3									4	2
5. Florida	2	1	2					1					3	
6. Georgia	3												5	4
7. Idaho		2	1		2		2	2					2	1
8. Iowa	2			1									8	
9. Louisiana	4						4						1	1
10. Maine							1	1					1	2
11. Massachusetts							1	2					11	15
12. Michigan State	4	6	2	2			2	4	1	2	2	1	38	32
13. Michigan Univ.	19	14	3				5	7			11	11	4	9
14. Minnesota	4	8		1									4	1
15. Missouri	4	1											4	3
16. Montana	3	2					1	1					33	19
17. New York	15	7	6	5			5	3	1		6	4	5	3
18. North Carolina	1	3	4										8	4
19. Oregon	5	3	3	1									10	2
20. Pennsylvania	6	1	2				2	1					5	2
21. Purdue	3	1		1			2						9	12
22. Utah					2	5	7	7					6	5
23. Washington Univ.	6	4		1										
24. West Virginia													20	15
25. Yale	17	12	3	3										
Total	118	76	38	18	5	6	38	32	2	2	19	16	220	150
Schools not accredited														
1. Connecticut								1						1
2. Virginia Poly. Inst.							6	4					6	4
Total							6	5					6	5
Grand total	118	76	38	18	5	6	44	37	2	2	19	16	226	155

TABLE 4.—DOCTOR DEGREES GRANTED FOR COMPLETION OF STUDIES IN SPECIALIZED FIELDS AT SCHOOLS OF FORESTRY IN THE UNITED STATES—CALENDAR YEARS 1952 AND 1953

Accredited schools	General forestry		Wood technology		Wildlife management		Others		Total	
	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953
1. California	1	2							1	2
2. Duke		7		1						8
3. Michigan State	1	1		1					1	2
4. Michigan Univ.	3	3	1		3			4	7	7
5. Minnesota	3								3	
6. New York	3	4	1	1			1		5	5
7. Purdue	1								1	
8. Washington Univ.	1	1	3						4	1
9. Yale	1	2	2						3	2
Total	14	20	7	3	3		1	4	25	27

percent, were awarded in the field of *General Forestry*. The only other major field granting the doctor's degree in 1953 was *Wood Technology and Utilization* where 3 degrees were awarded. Only 7 schools awarded the doctor's degree in 1953 while there were 8 in 1952 (Table 4).

Summarizing past records, we find that 21,559 bachelor's degrees, 3,768 master's degrees and 285 doctor's degrees have been awarded since 1900 (Table 8).

Undergraduate Enrollment

This year the undergraduate enrollment has shown an increase for the first time since 1948, increasing from 4 691 in 1952 to 4,909. While the increase is only 218, it definitely marks an upward swing (Table 5).

This upswing has been brought about by an increase in both the freshman and sophomore classes; the freshman class increasing from 1,536 to 1,698, and the sophomore class from 1,012 to 1,168. The junior enrollment on the other hand dropped from 1,013 to 917, making it the smallest of the four classes. The senior class, in effect, held its own, dropping only from 1,130 to 1,126 (Table 6).

Assuming the same trends now evident, the freshman, sophomore, and junior classes should each show an increase next year, while the senior class, because of the small enrollment in the present junior class, will show a further decline. Considering all of these factors, present indications are that there will be a slight increase in the total enrollment in 1954 with a total of slightly over 5,000.

The enrollment of women in the schools of forestry throughout the nation continues to be insignificant. While the number enrolled increased from 10 to 16, this is only 1.5 percent of the total enrollment of 1,027. Last year there were 5 freshmen, 2 sophomores, and 3 juniors. This year, there are 8 freshmen, 5 sophomores, and 3 seniors. Without analyzing the statistics for the two years, one might assume that the 5 freshmen became the 5 sophomores, and the 3 juniors the 3 seniors. If this is true, what happened to the 2 sophomores?

TABLE 5.—ENROLLMENT BY CLASSES AT SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE FALL TERM 1953-54

Accredited schools	Freshmen	Sophomore	Junior	Senior	Total undergraduates	Graduates Masters	Graduates Doctors
1. Alabama	56	11	11	13	91	3	
2. California	13	21	28	26	88	8	11
3. Colorado	116	54	59	59	288	15	
4. Duke						27	4
5. Florida	40	20	12	16	88	4	
6. Georgia	39	31	21	41	132	4	
7. Idaho	68	38	21	39	166	15	
8. Iowa	66	46	32	37	181	6	3
9. Louisiana	35	26	19	25	105	5	
10. Maine	88	53	34	45	220	4	
11. Massachusetts	39	26	25	27	117	4	
12. Michigan State	127	70	107	119	423	29	16
13. Michigan Univ.	10	27	17	60	114	29	28
14. Minnesota	46	47	26	31	150	7	5
15. Missouri	36	36	16	18	106	3	
16. Montana	64	39	39	37	179	6	
17. New York	161	142	108	121	532	57	43
18. North Carolina	71	35	23	45	174	9	1
19. Oregon	91	87	38	51	267	15	
20. Pennsylvania	99	64	59	56	278	12	
21. Purdue	46	34	29	33	142	8	
22. Utah	53	34	27	40	154	30	10
23. Wash. Univ.	64	48	50	46	208	11	6
24. West Virginia	37	24	19	22	102		
25. Yale						32	9
Total	1,465	1,013	820	1,007	4,305	343	136
Schools not accredited							
1. Arkansas	16	14	12	17	59		
2. Connecticut	11	12	14	7	44	4	
3. La. Poly. Inst.	21	13	11	9	54		
4. Mich. Mining	42	19	7	16	84		
5. New Hampshire	30	10	10	13	63		
6. Oklahoma	31	39	13	22	105		
7. Texas (S. F. Austin)	12	10	8	6	36		
8. Univ. of the South	10	5	3	3	21		
9. Virginia Poly. Inst.	34	16	6	13	69	2	3
10. Wash. State	26	17	13	13	69		
Total	233	155	97	119	604	6	3
Grand total	1,698	1,168	917	1,126	4,909	349	139

Graduate Enrollment

Last year graduate enrollment was confined to 23 of the 25 accredited schools. This year 24 accredited schools and 2 non-accredited schools report graduate students. Of the 347 master's candidates 157 or 45 percent are registered in *General Forestry*. *Wildlife Management* accounts for 74 students or 21 percent, and *Wood Technology and Utilization* 58 students or 17 percent. New York (23), Yale (21), and Duke (16), lead in the number of candidates in *General Forestry*. New York (12), Yale (11), and Duke (9) also lead in the field of *Wood Technology and Utilization*. Utah (21) accounts for 30 percent of the enrollment in *Wildlife Management*, and Michigan State (10) is second with 14 percent. Only three schools (Colorado, Idaho, and Utah) have master's candidates in *Range Management* and only two (Michigan State and New York) have candidates in *Forest Recreation* (Table 7).

Eleven schools report candidates for the doctorate with New York (43) again leading the list, followed by the University of Michigan (28) and Michigan State (16). *General Forestry* accounts for 57 of the 136 candidates, *Wood Technology and Utilization* for 25, and *Wildlife Management* for 24 (Table 7). Enrollment figures for the doctorate are of less significance than those for either the bachelor's or master's degrees because of the length of time involved in completing the degree. For example, only 21 percent of those registered for the doctorate in the fall of 1952 received their degrees in 1953, while 55 percent of 1952 fall enrollment for the master's degree received degrees in 1953.

Summary

The decline in enrollment which began in the 1949-50 scholastic year has finally been stopped. While the increase this year is less than 5 percent there is every indication that it is the beginning of an upward trend, since both the freshman and sophomore classes show a definite increase. This upswing was forecast last year when the freshman class showed an increase for the first time in six years.

There is a slight increase in the graduate enrollment over 1952, but it is almost identical with the enrollment in 1951, both as to master's and doctor's candidates (Table 1).

TABLE 6.—UNDERGRADUATE FALL-TERM ENROLLMENTS BY CLASSES IN SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE YEARS 1944-1945 THROUGH 1953-1954

Academic years	—Freshmen— Enrollment	Change	—Sophomores— Enrollment	Change	—Juniors— Enrollment	Change	—Seniors— Enrollment	Change	—Totals— Enrollment	Change
1944-1945	321	+ 122	114	+ 20	64	— 37	72	— 37	571	+ 68
1945-1946	840	+ 519	315	+ 201	205	+ 141	113	+ 41	1,473	+ 902
1946-1947	3,611	+2,771	1,840	+1,525	914	+ 709	645	+ 532	7,010	+5,537
1947-1948	2,061	—1,550	2,878	+1,038	1,577	+ 663	938	+ 293	7,454	+ 444
1948-1949	1,851	— 210	2,178	— 700	2,497	+ 920	1,686	+ 748	8,212	+ 758
1949-1950	1,485	— 366	1,667	— 511	1,816	— 681	2,501	+ 815	7,469	— 743
1950-1951	1,442	— 43	1,379	— 288	1,384	— 432	1,730	— 771	5,935	—1,534
1951-1952	1,370	— 72	1,107	— 272	1,053	— 331	1,269	— 461	4,799	—1,136
1952-1953	1,536	+ 166	1,012	— 95	1,013	— 40	1,130	— 139	4,691	— 108
1953-1954	1,698	+ 162	1,168	+ 156	917	— 96	1,126	— 4	4,909	+ 218

The continued decline in the number of students in the senior and junior classes is reflected in the decline of undergraduate degrees granted. The number of master's degrees granted also declined slightly, while the number of doctor's degrees awarded was increased by two.

A breakdown of the fields of specialization show that nearly three-fourths of the bachelor's and doctor's degrees and half of the master's degrees were granted in the field of *General Forestry*. *Wildlife Management*, and *Wood Technology and Utilization* accounted for most of the others.

TABLE 7.—ENROLLMENT OF GRADUATE STUDENTS IN SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE FULL TERM 1953-1954

Accredited schools	General forestry		Wood technology		Range management		Wildlife management		Forest recreation		Other		Total	
	Master	Doctor	Master	Doctor	Master	Doctor	Master	Doctor	Master	Doctor	Master	Doctor	Master	Doctor
1. Alabama	3		---								---		3	
2. California	8	11	---								---		8	11
3. Colorado	1	---	---		6		8		---	---	---		15	---
4. Duke	16	3	9	1							2		27	4
5. Florida	1		2				1						4	
6. Georgia	3										1		4	
7. Idaho	4		1		5		5						15	
8. Iowa	5	3	1										6	3
9. Louisiana	2						3						5	
10. Maine							4						4	
11. Massachusetts							4						4	
12. Michigan State	3	5	6	2			10	7	5		5	2	29	16
13. Michigan Univ.	11	7	3	4			2	4			13	13	29	28
14. Minnesota	6	4	1	1									7	5
15. Missouri	3												3	
16. Montana	6												6	
17. New York	23	15	12	11			8	5	1		13	12	57	43
18. North Carolina	3		6	1									9	1
19. Oregon	14		1										15	
20. Pennsylvania	6		2				4						12	
21. Purdue	6		1								1		8	
22. Utah	3				6	2	21	8					30	10
23. Washington Univ.	9	4	2	1						1			11	6
24. West Virginia														
25. Yale	21	5	11	4									32	9
Total	157	57	58	25	17	2	70	24	6	1	35	27	343	136
Schools not accredited														
1. Connecticut							4						4	
Grand total	157	57	58	25	17	2	74	24	6	1	35	27	347	136

TABLE 8.—NUMBER OF DEGREES GRANTED FOR COMPLETION OF STUDIES AT SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE CALENDAR YEARS 1900-1953

Years	Undergraduate degrees	Master's degrees	Doctor's degrees
1900	1		
1901	5		
1902	2	9	
1903	3	14	
1904	9	29	
1905	9	34	
1906	24	24	
1907	19	27	
1908	31	35	
1909	47	44	
1910	61	48	
1911	100	61	
1912	122	54	
1913	136	37	
1914	151	42	
1915	124	35	
1916	151	36	
1917	160	27	
1918	65	10	
1919	53	6	
1920	160	25	
1921	126	26	
1922	141	44	
1923	217	31	
1924	215	43	
1925	280	44	
1926	259	58	
1927	263	50	
1928	302	64	
1929	291	54	
1930	308	69	
1931	394	97	(34)[1]
1932	380	78	7
1933	355	65	6
1934	337	47	6
1935	423	58	8
1936	502	67	9
1937	803	75	7
1938	980	95	5
1939	1,102	112	8
1940	1,072	105	9
1941	834	117	12
1942	654	76	13
1943	446	28	6
1944	106	12	3
1945	51	18	7
1946	192	65	8
1947	553	223	7
1948	918	222	16
1949	1,443	205	12
1950	2,321	275	29
1951	1,564	267	21
1952	1,267	226	25
1953	1,027	155	27
Total	21,559	3,768	285

[1]Total doctor's degrees granted prior to 1932. Break down by years not available.

Notes

Comparison of Growth Rate of Three Species of Pine on Two Soil Classes on the Lake Vadnais Plantation, Minnesota

The effect of soil differences on the growth of trees has always been of interest to foresters. However, some of the comparisons that have been made are clouded by the great host of variables involved. The situation that exists, however, on the Lake Vadnais Plantation allows comparisons of tree growth from which a great number of the variables have been eliminated or reduced greatly in importance. The stands that make up the plantation stretch in narrow bands along the east and west shores of the lake. The soil to the west of the lake is a nearly sterile sand, almost structureless, and very droughty. When analyzed it was found to be Zimmerman loamy fine sand. The second site, to the east of the lake, is a soil that developed from glacial drift and is considered locally to be a good agricultural soil. When analyzed it was found that two types of subsoils were present. One was composed of the red drift of the Keewaten glacier and the other of gray drift of the Wisconsin glacier. The texture of both subsoils is classified as sandy clay. The surface soil that developed on the red drift is Milaca fine sandy loam, and that on the gray drift is Bradford fine sandy loam. Because of the similarity of surface soil, and slight variation in subsoil, the two types are combined in the study.

Comparable plantings as to year of planting, source of planting stock, method of planting and initial densities were made on the two sites. The species for which growth is compared are jack pine (*Pinus banksiana* Lamb.), red pine (*Pinus resinosa* Ait.) and white pine (*Pinus strobus* L.). It is accepted that many factors other than those of the soil are involved in determining growth of trees, and that many are extremely local in nature. However, from a more practical point of view, it is the macro-site conditions that produce the significant differences in growth rate.

It is assumed that climatic conditions in the area in which the study was conducted are constant due to the proximity of the stands, which were separated at the widest point by only nine-tenths of a mile. Also, the location of the stands is such that they all fall within the range of any tempering influence that might be offered by the lake. The topography is undulating, with differences in elevation in the study area of less than thirty feet. Aspect and slope of comparable study areas are similar. Therefore, macro-site factors, with the exception of soil conditions on the site, are considered uniform for the area.

The study involved the comparison of height and diameter growth during the juvenile and early-pole stage of the three species on two soil classes. Red and jack pine were 29 years old and white pine 28 years old when the study was made. Growth is compared in three ways: first, total height growth; second, total diameter growth; and lastly, diameter growth for the last 13 years in the lives of the stands. Growth comparisons and results are summarized in Table 1.

When height differences of the three pines on the two soils were analyzed, it was observed that no real difference existed in total height for red and jack pine, but a significant difference occurred in

TABLE 1.—SUMMARY OF DIAMETER AND HEIGHT GROWTH OF THE THREE SPECIES OF PINE ON TWO SOIL CLASSES

Soil Class	Ave. ht. at age 29 yrs.[1]	Difference	Statistical significance of difference[3]	Ave. dia. at age 29 yrs.[1]	Difference	Statistical significance of difference[3]	Ave. dia. at age 16 yrs.[2,4]	Ave. dia. increase for last 13 yrs.	Difference in diameter increase	Statistical significance of difference[3]
				Jack Pine						
	Feet	*Feet*		*Inches*	*Inches*		*Inches*	*Inches*	*Inches*	
Fine Sandy Loam	33.4	2.5	None	5.2	0.4	None	3.7	1.5	0.1	None
Loamy Fine Sand	30.9			5.6			4.2	1.4		
				Red Pine						
Fine Sandy Loam	33.5	2.9	None	6.0	0.3	Significant	3.3	2.7	0.3	Significant
Loamy Fine Sand	30.6			5.7			3.3	2.4		
				White Pine						
Fine Sandy Loam	32.9	1.5	Significant	5.8	0.3	Significant	2.1	3.7	0.1	Significant
Loamy Fine Sand	31.4			5.5			1.9	3.6		

[1]Age 28 years for white pine.
[2]Age 15 years for white pine.
[3]"Standard Error of the mean method for paired data" used to check differences.
[4]Measurements made by J. H. Allison, Univ. of Minnesota, St. Paul, Minnesota.

white pine. This would indicate a greater sensitiveness of white pine to soil condition in early life, with a preference for the better soil.

Total diameter growth and also diameter growth during the last 13 years for jack pine failed to show a real difference attributable to soil, indicating no apparent soil preference in early life.

Both red pine and white pine showed better growth on the fine sandy loam as indicated by significant differences in diameter growth, for both the total period and for the last 13 years.

Summary

Jack pine showed no sensitivity to soil difference in either height or diameter growth. Red pine showed preference for the better soil by real differences in diameter growth, but failed to show a significant difference in height growth. White pine showed a sensitivity to soil differences in both height and diameter growth.

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Hardwoods Now Predominate on Burn at Centerville, Maine

In the fall of 1947 a forest fire destroyed about 4,500 acres of timber owned by the St. Regis Paper Company in Centerville Township, Washington County, Maine. The company became interested in direct seeding from the air, and a cooperative experiment was arranged with the Northeastern Forest Experiment Station.

An area of about 320 acres in the southwest corner of Centerville Township was selected for the seeding experiment. Here the fire had been extremely hot. No living tree remained except for several small "islands" not more than one-half acre in size. On about 75 percent of the area the surface litter and duff had been burned down to mineral soil.

Before the fire there had been a vigorous stand of spruce, fir, and white pine averaging about 9 inches d.b.h., with patches of white birch, aspen, and red maple scattered throughout. The area had been cut about 20 years before.

White pine seed was sown by airplane at the rate of 5,000 seeds per acre on March 11, 1948—just before a snowstorm covered the area. The method used has been described by Westveld.[1]

A dry period starting in June 1948 continued throughout the summer and by the end of September the rainfall was nearly 6 inches below normal for the 4-month period. This was a a greater deficit than in 1947, which had been exceptionally dry.

One hundred twenty milacre plots were established to test the effectiveness of the airplane seeding. These plots were examined at the end of the first and second growing seasons (1948 and 1949) and again at the beginning of the fifth growing season (1952). By the end of the second growing season it was apparent that the airplane seeding had failed. Air-sown plots had no more white pine seedlings than unsown check plots (Table 1).

Although the airplane seeding was a failure, examinations were continued to find out what natural reproduction was becoming established on the burned area.

Spruce and balsam fir seedlings were found on the study plots in greater numbers than white pine (Table 2). In 1952 there were 558 spruce and fir seedlings per acre compared with 75 pines. The spruce seems to be holding its own among the softwood seedlings. It had a mortality of only 9 percent from 1948 to 1952, whereas white pine

TABLE 1.—SUMMARY OF WHITE PINE SEEDLING COUNTS

Item		40 air-sown plots			40 unsown check plots		
		Oct. 1948	Nov. 1949	Apr. 1952	Oct. 1948	Nov. 1949	Apr. 1952
Plots stocked	number	7	2	2	2	2	1
	percent	17.5	5.0	5.0	5.0	5.0	2.5
Total seedlings	number	7	2	2	2	2	1
Germination	percent	3.5[1]					
Mortality	percent		71.4	71.4		0	50.0
Plots stocked per acre	number	175	50	50	50	50	25
Seedlings per acre	number	175	50	50	50	50	25

[1]Assuming an even distribution of 5 seeds per milacre plot.

TABLE 2.—NUMBER OF SOFTWOOD SEEDLINGS PER ACRE AND SEEDLING MORTALITY[1]

Species	Live seedlings			Mortality		
	Oct. 1948	Nov. 1949	Apr. 1952	1948-49	1949-52	1948-52
	No.	*No.*	*No.*	*Percent*	*Percent*	*Percent*
Pine	175	166	75	33.3	28.6	57.1
Spruce	483	558	508	0	9.0	9.0
Fir	325	250	50	23.1	80.0	84.6

[1]Based on 120 milacre plots.

TABLE 3.—SPECIES ON STOCKED PLOTS, IN PERCENT OF PLOTS WITH ONE OR MORE STEMS

Species	Stocking in—		
	Oct. 1948	Nov. 1949	Apr. 1952
	Percent	*Percent*	*Percent*
Pine:			
Air-sown[1]	17.5	5.0	5.0
Control[1]	5.0	5.0	2.5
Spruce[2]	25.0	27.5	23.3
Fir[2]	13.3	8.3	5.0
Spruce or fir[2]	34.2	31.7	26.7
Hardwoods[3]			83.0
Raspberry[3]			10.0

[1]Based on 40 milacre plots.
[2]Based on 120 milacre plots.
[3]Based on 30 milacre plots.

[1]Westveld, Marinus. Airplane seeding: a new venture in reforestation. Soc. Amer. Foresters Proc. 1948: 302-311. 1949.

had a mortality of 57 percent, and fir 85 percent.

At the time of the 1952 examination, hardwoods were coming in strongly. Aspen, birch, or red maple were found on 83 percent of the air-sown study plots (Table 3). Raspberry bushes were found on 10 percent. Only 7 percent of the plots had softwood seedlings not yet overtopped by weeds or hardwoods.

The softwood seedlings ranged in height from 3 to 12 inches. The hardwoods ranged from 2 to 12 feet.

This study indicates that the next crop on this part of the Maine burn will be mostly hardwoods. The softwoods will be subordinate in the stand for years unless released. But it is encouraging that, in spite of the intense burn, Nature is restocking the area with merchantable species.

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Points of View

We Need an American Society for Forest Genetics

American forestry has taken "giant steps" in the past twenty-five years. Utilization, mensuration, economics, silviculture, and all of its other components now require specialized skills of a high order. The profits accruing from advances in these fields can be measured in dollars and cents. This is not true of another rapidly expanding segment of our profession, forest genetics.

Never before has one field of endeavor accepted the methodology and tools of another so eagerly and readily as forestry has accepted those of genetics. In a profession which prides itself on being businesslike, this is mildly surprising, but pleasing. Some phases of genetics activities, i. e., irradiation of seed, are based on a million-to-one chance that a better product will be obtained. Genetic improvements are difficult and expensive to produce. Once a superior selection is made, hybrid produced, or clone developed, long periods of time must pass before the improved forms can be available for commercial production. Economists have not yet shown that the increased value of forest products resulting from improved species will warrant the expense of obtaining them. Even so, our eyes gleam when we discuss the potentialities of forest genetics.

In spite of the tremendous task they face, researchers are adapting old techniques, developing new ideas, and hopefully expanding forest genetics activities. This sudden burst of activity has the spiritual and monetary sanction of American forest industry.

In the development of every new facet of science, a time comes when closer contact is needed between the scientists involved. This results in a more efficient exchange of information and ideas. In the flurry of activities that have taken place in the past few years, a Forest Genetics Research Foundation as well as a number of responsible regional genetics organizations have been formed. However, a general unifying organization open to all interested persons has not yet taken shape. This is an appropriate time to examine the requirements, functions, and ideals for a genetics organization of continental dimensions. Following is an abbreviated list which might serve as guideposts:

1. More extensive reporting of locations of superior trees and stands.

2. More careful delineation of the provenance zones of North America.

3. A study of world climates for the purpose of locating ecologically equivalent areas for the introduction of exotics.

4. The rapid reporting of new cytological, hybridizing, and other improved genetics techniques.

5. Compilation of an atlas of flowering and fruiting dates of North American tree species.

6. Translation or summarization of important genetics articles published in languages other than English.

7. Promotion of periodic reviews of advances made in forest genetics.

8. Promotion of "fundamental" genetics research programs.

The diversity of skills required makes it imperative that a well-founded organization should be open to all persons interested in forest genetics. Plant systematists, foresters, geographers, ecologists, cytologists, radiation biologists, and physiologists as well as geneticists can be integral contributors. The door must be open to all persons who can and should make either fundamental or immediately applicable contributions. For this reason the title "American Society for Forest Genetics" is suggested. Such an organization should include potential contributors throughout North America. This is a natural geographic unit, isolated, and with relatively small language barriers between its peoples.

All types of genetics activities should be given complete freedom for development. Selection, hybridization, irradiation, and development of polyploid strains should receive free rein. Who is to say what might develop into the most important phase of forest genetics in the next twenty-five years?

There are a number of persons in the United States and Canada who have the technical skills, critical perspective, and well earned universal respect necessary to take the leadership in a North American forest genetics organization. It is hoped that this note will stimulate discussion and action toward the formation of such a society.

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Reviews

Developing Farm Woodlands

By John F. Preston. 386 pp. Illus. McGraw-Hill Book Company, New York. 1954. $4.50.

The title of this well written book is happily chosen. It is one of a series about rural activities. Accordingly, this text on forestry takes its place among a dozen companion books devoted to important phases of farming such as dairying, poultry management, and soil management.

Preston continually stresses the fact that timber is a crop and that it can, and should, play an important role in diversified agriculture. He urges the landowner first to get acquainted with his woods, and second to size up his markets carefully. With this basic information, he is then ready to make his final decision for procedure. Preston points out that extension, state, and consulting foresters can provide valuable aid in developing the plan, and in conducting the cutting operation.

The book contains a lot of good, general information on the topic of planting. However, Preston wisely cautions the reader to consult his local forestry agencies for specific information relating to species, the selection of sites, methods of planting, etc.

Weeding and releasing young trees is a subject whose importance is realized by the author as set forth in quoting A. C. Cline: "Weeding has a greater and, when properly applied, a more beneficial effect on the make-up of a stand than any other silvicultural operation." There is also an up-to-date discussion of the use of herbicides in weed tree control.

By and large, Preston bases his thinning recommendations on the $D + 4$ formula, in which D is the diameter of the tree, in inches, and 4 is the constant. Perhaps some foresters will be critical of the wide degree to which the author applies this formula, but I have observed its operation in the woods and feel that it has some strong selling points. Certainly it is a formula that the farmer can readily understand and follow.

In the chapter on cutting the wood crop the author really makes the chips fly. Here we have a happy combination of the "woodman spare that tree" sentiment with the concept of the practical forester meeting a practical problem in the woods. This chapter deals with all the practical phases of applying the axe and saw to the woods.

And in conjunction with cutting, comes the marketing phase of the woods operation. Preston presents a good general discussion of this most important activity. He advises the would-be vendor that "marketing problems are worth struggling with," and sympathetically states, "the forest manager who has no worries on this score is fortunate indeed." Helpful suggestions are given as aids in marketing diversified forest products.

Chapters deal also with managing the farm woods for maple sap, Christmas trees, and naval stores. The appendix contains useful tables and information of value to the farm woodland manager.

MARLIN H. BRUNER

Plant Genera: Their Nature and Definition.

A symposium by G. H. M. Lawrence, I. W. Bailey, A. J. Eames, R. C. Rollins, M. S. Cave, and H. L. Mason. 160 pp. Illus. Chronica Botanica Co., Waltham, Mass. 1953. $2.

The editor, Dr. Frans Verdoorn, in his foreword states an interesting problem in a way that many nontaxonomic botanists and foresters will applaud.

"Very often, as a result of their special problems, the botanical and horticultural taxonomists have accustomed themselves to thinking in terms of species, subspecies or varieties. These units, natural or artificial, seem to them the only things that matter. The general biologist and the intelligent public (and even the worker in another field of taxonomy) cannot follow the specialized taxonomist, who seems to have forgotten that there is a higher level to which many a specialist in another field, the general biologist, the intelligent amateur, will in many a case follow him, namely the genera.

". . . . The general biologist differs from the taxonomist in not having the time, the interest and, above all, not the psychological bent to follow him in his endless rambles through the world of species, subspecies and varieties, with the unavoidable, for him seemingly absurd problems of nomenclature. It is a shame indeed to realize that we taxonomists have not prepared, in the 200 years which elapsed since Linnaeus's time, anything like a series of generic works, for the various temperate and tropical regions of the world, with which biologists, and other intelligent and interested people, can identify the principal forms of plant and animal life, their names, structure, relationships, and all the interesting ecological and other general biological details which can be given in a few words about most forms of plant and animal life."

The symposium deals with the trends of modern thinking in taxonomy, but nowhere was your reviewer able to find a discussion of the topic suggested by the title, that is, the nature and definition of that philosophical construct called the genus.

JOHN P. DECKER

Pioneer Plant Geography: The Phyto-geographical Researches of Sir Joseph Dalton Hooker.

By W. B. Turrill. 267 pp. Illus. Chronica Botanica Co., Waltham, Mass. 1953. $6.

Reports of present plant distribution leave us wondering about conditions before civilization spread so widely. We look to records of early travellers and often they had viewpoints so different that interpretation is difficult. Sir J. D. Hooker was seasoned, scientifically, by a lifetime association with Kew Gardens. He was a competent taxonomist and the writing of *Genera Plantarum* (with G. Bentham) gave him scope that enriched all his botanical observations. He knew the plants he saw and had a trained judgment for picking out those with phytogeographical significance. Finally, his work spans the period when Darwin's *Origin of Species* was testing all types of biological thought.

Dr. Turrill has been painfully careful to do Hooker full justice. Yet, where subsequent research has revealed corrections, Turrill succinctly clarifies the facts as they are available. Frequently the story is told by direct quotation with rather long excerpts so as to avoid the error of plucking a passage out of context and laying it open to misinterpretation. Documentation is clear and complete with over 400 references listed.

Some of Hooker's most valuable studies were made in the Antarctic, Arctic, Africa, and India. He often studied island groups such as the Galapagos and Atlantic islands. This is interesting since a fairly complete species list can be made and in some ways an island group offers a botanically discrete unit. He also studied eastern Mediterranean areas and North America.

Hooker visited the United States in 1877 and made an extensive trip through the Rocky Mountains with Asa Gray, eventually reaching the west coast. This was considered a joint investigation. They grouped the floras into three broad regions, each being further divisible: (1) Atlantic slope and Mississippi region, (2) Rocky Mountain region, and (3) Pacific Slope region. Both men had fairly good ideas about the effects of glaciation and changes in sea level. They visited Dr. George Engelmann in St. Louis and later joined up with the famous Hayden surveying party. So much detail has been added to the knowledge of our continent's vegetation since then that this pioneer work is only of limited historical interest. Turrill compares Harshberger's work on North America by saying that he adds little to the wider phytogeographical problems that so greatly interested Gray and Hooker.

Sir Joseph was an excellent note-taker and his skills extended to making accurate drawings. This permitted identification of plants from sketches, as well as representation of geologic features or vegetation types. A number of drawings are given in the book, both before and after redrawing for publication. A photograph shows Dr. Asa Gray, Dr. F. V. Hayden, and Sir J. D. Hooker on La Veta Pass, Colorado.

PAUL C. LEMON

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Partial Cuttings in Northern Hardwoods of the Lake States

By F. H. Eyre and W. M. Zillgitt. 124 pp. Illus. U. S. Dept. Agric. Tech. Bul. 1076. Supt. of Documents, Washington, D. C. 1953. 40 cents.

The upper Peninsula Experimental Forest at Dukes, Michigan, was established in 1926 for the purpose of studying partial cuttings in northern hardwoods. During the past twenty years numerous progress reports have been published covering the work conducted on the forest.

The authors have effectively combined and summarized the findings of twenty years of research on the forest, supplemented with information gained elsewhere in the Lake States, into a comprehensive monograph. In fact, it is a management handbook for mature northern hardwood stands. Unfortunately, the experimental work did not enable the authors to make conclusive cutting recommendations for the "bulk of the second growth now coming in." It is gratifying to learn, however, that experiments are underway elsewhere "aimed at developing best methods of handling second-growth hardwoods."

The layout of the experimental plots, from which much of the information for the bulletin was obtained, exhibited a common failing of early forestry research in that the treatments were not properly replicated. Being aware of this the authors hastened to point out that several of the cuttings were fairly similar, "so that an element of replication is provided." This, plus wide variation in silvicultural treatments and uniformity of sites made treatment comparisons possible.

Under the various cutting intensities net annual increment ranged from 20 to 252 board feet per acre. According to the authors best results under a 15-year cutting cycle were produced by leaving a stand of 4000 to 7000 board feet, or 50 to 75 square feet of basal area per acre after the first cutting. A glance at the data representing ingrowth, height changes, basal area change, percent increment, and diameter growth convinces one of the many advantages of good forest management.

Selection cutting is recommended for most mature stands with particular emphasis on group selection in deference to the silvical needs of yellow-birch. The importance of growing quality timber is stressed, and methods for increasing quality characteristics in a stand are suggested. Considering both economic and silvicultural evidence the authors tentatively recommend 24 inches d.b.h. as the upper diameter limit for northern hardwoods growing under conditions similar to those of the Upper Peninsula Experimental Forest.

The appendix provides volume tables and information on log grades, tree grades, and cull deductions.

The authors state that "Timberland owners, timber operators and managers of public forests who are making first or second partial cuttings in northern hardwoods, those who still are clear-cutting old growth and even those who are operating in advance growth of younger timber should be interested in these experimental results." Change the "should" to "will" and the reviewer will be in complete agreement with the statement.

T. D. STEVENS,

Land Problems and Policies

V. Webster Johnson and Raleigh Barlowe. 422 pp. McGraw-Hill Book Co., New York. 1954. $6.50.

Land Problems and Policies is basically an economics book. In it the land problems and policies of the United States are analyzed economically.

Land economics and its companion field, land policy, as generally interpreted would include the fields of forest economics and forest policy. In this respect the book follows the conventional approach and many examples ase employed which are closely related to forestry. The fact that the scope of the book is broader than forest economics and policy should make it valuable reading for most foresters since it gives an indication of how forestry fits into the broad resource picture.

Dr. Johnson is the former Head of the Division of Land Economics in the Bureau of Agricultural Economics and Dr. Barlowe is professor of land economics at Michigan State College. Both men have had considerable experience with the economic problems of conservation and also some direct experience with problems in the economics of forestry. In addition portions of the book are based on the unpublished notes of the late Dr. L. C. Gray whose name many foresters may recognize for his early writings on the economics of conservation.

The general scheme of approach employed in the book is historical. The authors trace the development of land policy in the U. S. briefly but, yet, with surprising completness. They then point out how the transition took place from a public policy of land disposal to a policy of reacquisition and management. The authors credit the conservation movement as an important force helping to bring about this change.

When the authors analyze a problem economically they refrain from first developing an elaborate economic theory. Actually they employ only the minimum of economic theory which makes the book easier reading for a person not trained in economics. The type of economics that is used belongs to that school of thought which economists call institutional economics. This school believes that such factors as law, custom, etc. are as important in affecting economic behavior as the profit motive.

For example, several chapters are devoted to developing the legal framework which forms the basis for present and possible future U. S. land policy. It is shown how much basic American concepts as rights in property have contributed to our land problems. There are inclused discussions on taxation, rural zoning, subsidies, soil conservation districts, grazing districts, and others.

In looking for something with direct application to their field, foresters likely would be most interested in the portion of the book devoted to the economics of conservation. Most of the examples deal with the economics of soil conservation. However, little imagination is required to realize how the same principles might be applied to forestry.

Foresters will also find interesting reading in the section on land requirements. Past trends in the pattern of land use are pointed out and then projected into the future on the basis of population predictions. A discussion of prospective requirements for forest land and forest products is included under this topic. However, the forestry discussion is based almost entirely on the 1948 Reappraisal Report.

Readers will find a mature approach employed throughout which, coupled with a fluent style, makes interesting and enjoyable reading.

JAMES G. YOHO

Principles of Nursery Management

By Willis P. Duruz. 176 pp. Illus. A. T. De La Mare Company, Inc., New York 18. 1953. $3.50.

Willis P. Duruz, professor of horticulture at Oregon State College, has presented a clearly written and readable book in this second edition of *Principles of Nursery Management*. The emphasis is on commercial nursery practice, but will be of interest to foresters concerned with forest nursery practice and to those many foresters who some day plan to operate a small nursery of their own.

The material covered is broad as the title implies. The nature of the nursery business is first discussed. This is followed by a discussion of factors to be considered in choosing a nursery site, and factors of site and location in relation to population centers are considered. Next, methods of growing seedling stock and propagation by vegetative methods are discussed. Treatments on moving and storing nursery stock, grading, and shipping are followed by pest control and plant quarantine. The final two chapters of the book treat business aspects of nursery management from the standpoint of selling and administration of the business.

The chapters "Growing of Seedlings" and "Culture in the Nursery" seem to the reviewer to be the most valuable for the forest nurseryman. Seed collection; seed storing, including specific recommendations for several forest species; methods of sowing, including seeding rates for a few conifers; and transplanting are covered in these sections. However throughout the book there is information which is helpful to the forest nurseryman and forester.

Recommendations for applications of amounts of fertilizer, both inorganic and organic, are present-

ed in table form for seedling and transplant beds of both conifers and hardwoods. In the same section nitrogen contents of organic fertilizers are included.

One of the discussions of interest, quoted from the "American Nurseryman," concerns the use of sawdust as a plant mulch. It is pointed out that often the bad qualities of sawdust proved its disadvantages to be greater than its merits. However, sawdust was found to be an excellent medium for germinating some large seed such as acorns where the rodent problem is serious. The ground is prepared, and a trench about two inches deep and a foot wide scooped out. Commercial fertilizer is spread over the bottom of the trench, and worked into the soil. Seeds are next planted in the trench and covered to surface soil level with sawdust. Next, soil is mounded to a depth of four to six inches. This mounded soil is removed in the spring when shoot growth starts. Since this treatment is reported as helping control the rodent problem, it may be of use in the nursery or even in partial seeding operations.

One section of interest, although probably of little importance in forestry, is the discussion of dwarf trees. Methods by which they are developed and propagated are described.

If you want a picture of the nursery business in all its aspects, this book will give it to you. This book should be especially valuable to a person who contemplates starting a commercial nursery.

E. H. Tryon

Drying Rates of Thin Sections of Wood at High Temperatures

By Herbert O. Fleischer. 86 pp. Illus. Yale University School of Forestry, New Haven, Conn. 1953. $1.50.

The physical phenomena involved in the drying of veneer as compared with the drying of lumber have never been thoroughly studied. This fundamental study of drying rates of thin sections of wood at high temperatures casts much light on the drying mechanism involved in the usual veneer drying processes.

Wood sections in thicknesses of 1/32-inch to 1/4-inch were dried at temperatures up to 350° F. under closely controlled conditions of humidity and air circulation. In pieces 1/4-inch thick, and in some cases 1/8-inch thick, drying rates were found to be comparable to those for lumber, that are generally assumed to be controlled primarily by the rate of diffusion of water through the wood. In thinner sections the drying did not appear to be retarded by the slow diffusion process, but proceeded as rapidly as heat could be supplied to evaporate water from the wood.

Based on considerations of heat transfer, a method of expressing drying rates in simple mathematical terms was developed. The significance of the various factors affecting drying rates was established. Some observations are included on the drying defects that may occur when thin wood is dried at high temperatures.

It is expected that the mathematical methods outlined in this study may be applied to practical problems of veneer drying rates, such as the development of drying rate control charts for commercial veneer drying operations.

The bulletin, which is number 59 in the Yale School of Forestry's published series, is a condensation of a dissertation submitted for the Ph.D. degree. The study was made at the Forest Products Laboratory where the author is a technologist in veneer and plywood.

Irrigation Development and Public Water Policy

By Roy E. Huffman. 336 pp. Ronald Press Company, New York, N. Y. 1953. $6.50.

In these days of pressure groups and all-pervading politics when one is forced to read between the lines habitually in order to brace himself against the "slant," it is reassuring to read a book that is both candid and objective. Though matters concerning our water resource, the life-blood of our national strength, should be free of political bias, many speakers and writers on the subject are either "for" or "against" some phase of water development that seems to involve political issues. Dr. Huffman has done an excellent job of stating and documenting the facts. He has pointed to weaknesses in past land and water policies, and stresses the importance of developing a sound policy for the future without seeming to take sides or point the finger at anyone.

Past public irrigation enterprises in the United States have been considered mainly as physical engineering problems and have been judged largely by the size of the dam and the acreage put under the ditch. According to the author, ". . . public irrigation policy should be an integral part of long-range economic and social policy."

Dr. Huffman discusses the various land acts passed during early settlement days, and the doctrines, laws, and philosophies concerning water rights and ownerships which together have banketed the western states with a crazy-quilt pattern of laws and practices that almost defy understanding or organization. After reading about the problems of irrigation project organization, the financing and developing of an efficient irrigation farm unit, one wonders whether it is worth the effort at this time or whether it might be well to leave some of our undeveloped lands in dry storage until they are more urgently needed. If lands could be developed under pressure of real need rather than political expediency, many of the present problems would disappear. The urgent need to take better care of the land now under development, both irrigated and nonirrigated, is clearly stated.

Several early and contemporary federal irrigation projects are cited as examples of different types and degrees of development. Through these examples the reader sees some of the real and fancied difficulties and the overwhelming need for a sensible long-range national water policy.

In his discussion of river basin development programs the author shows clearly how and why soil and water are so intimately related that it is impossible to plan for development of one without considering the other as a full partner. Economic and social factors demand that developments of any appreciable size in one locality must be considered in relation to the larger community. The case is clearly made that the butcher, the baker, and the candlestick maker have a stake in each water development as surely as have the irrigation farmer and the construction engineer.

Dr. Huffman has done a fine job of pointing out some of the weaknesses of our present land and water policies. His book leads to a better understanding of these resources. Though he does not presume to give all the answers, he ends the study with the statement of twenty "components of a sound irrigation policy."

I cannot recommend the book as light reading, but I certainly can recommend it as worthwhile reading for anyone interested in a sound future for the western states.

C. ALLAN FRIEDRICH

Publications of Interest

Forest Industries of the Philippines is a report on the forest products industries of that country. It was prepared by Winslow L. Gooch while serving as forest products utilization specialist of the U. S. Mutual Security Agency in cooperation with the Philippine Bureau of Forestry. In the words of Florencio Tamesis, director of forestry, Department of Agriculture and Natural Resources, Republic of the Philippines, the report is "comprehensive and up-to-date.... The information is useful from the standpoint of government requirements and as a guide to expansion of industries needing the products of Philippine forests as raw materials. It will be valuable to those who may be interested in information on the development of such forest products." The 160 page, paper bound, report is published by The U. S. Mutual Security Agency and the Philippine Council for U. S. Aid, Manila.

* * *

Forestry Features for School Use is a new booklet released by the Forest Farmers Association, P. O. Box 7284, Station C, Atlanta, Ga. It is a compilation of the school pages on forestry which appeared in *The Forest Farmer* between October, 1952 and October, 1953. Priced at $1 each.

* * *

The American Paper and Pulp Association, 122 E. 42nd. St., New York 17, has issued *A Study of Community Dependency on the Paper and Pulp Industry.* This report supersedes a similar one published in 1942. It demonstrates that industry's importance to the U. S.

* * *

The annual report of the Secretary of the Interior for 1953 is available at $1.25 per copy from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

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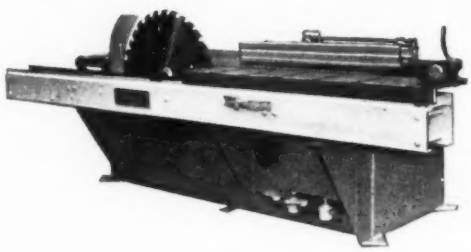

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Current Literature

Compiled by MARTHA MEELIG, *Librarian, State University of New York College of Forestry*

Range Management Section Compiled by FRANCES FLICK, *Library, U. S. Department of Agriculture*

General

American Woods series revised 1953—Alaska Cedar, American Holly, Eastern Hemlock, Osage-Orange, Red Pine. U. S. Forest Serv., Washington 25, D. C. 5 cents ea. (Govt. Print. Off.).

Annual Report on Active Forest Research Projects for the Year Ended March 31, 1953. Part I-III. Canada Department of Resources and Development. Forestry Branch, Ottawa. Mimeog.

The Forest Products Laboratory: A Brief Account of its Work and Aims. 33 pp. Illus. U. S. Forest Serv., Washington 25, D. C. 1953. Agric Info. Bul. No. 105 (Supercedes Misc. Publ. No. 306). 15 cents (Govt. Print. Off.).

Oaks Native to the Washington, D. C. Region. 4 pp. U. S. National Park Serv., Washington 25, D. C. 1953.

Farm Forestry

Woodlots on Ontario Farms. By D. J. Packman. 39 pp. Illus. Dept. of Agric., Ottawa. 1953. Publ. No. 890.

Forest Economics

Elements of Forest Economics. By Sven Petrini, trans. by M. L. Anderson. 210 pp. Oliver & Boyd, Ltd., Edinburgh. 1953. 22s. 6d.

Företagsekonomisk Forskning och dess Tillampning inom Skogsbruket. By K. V. Algvere. 22 pp. Reprint from Svenska Skogsvardsföreningens Tidskrift Nr. 4. 1952. Stockholm, Sweden.

Forest Influences

Waters of Coweeta. 22 pp. Illus. U. S. Forest Serv., Washington 25, D. C. 1953. U. S. Dept. of Agric. Info. Bul. No. 117. 20 cents (Govt. Print. Off.).

Forest Management

An Aid in Choosing the Right Tree to Leave. By C. A. Bickford. 8 pp. Northeastern Forest Expt. Sta., Upper Darby. 1953. Station Paper No. 65.

Control of Vines in Ohio Timberlands. By W. R. Anderson. 2 pp. Ohio Agric. Expt. Sta., Wooster, Ohio. 1953. For. Mimeog. No. 8.

Forest Products

Operations in the Woods; Final Estimates of Forest Production . . . 1951. 16 pp. Dominion Bur. of Statistics, Ottawa. 1953. 25 cents.

Pulpwood Selling Practices in Georgia. By J. R. Hamilton, E. T. Faris, and R. D. Dixon. 16 pp. Illus. Univ. of Georgia College of Agric. Expt. Sta., Experiment. 1953. Bul. No. 279.

Forest Resources

Forest Resources of North Idaho. By H. J. Pissot. 37 pp. Northern Rocky Mt. Forest & Range Expt. Sta., Missoula. 1953. Sta. Paper No. 35.

Forest Statistics for Alabama. 52 pp. Southern Forest Expt. Sta., New Orleans. 1953. Forest Surv. Release No. 73.

Logging and Milling

Analysis of California Logging and Sawmill Fatalities . . . and Injury Prevention Program. Illus. folder. California Dept. of Industrial Relations Div. of Industrial Safety, Los Angeles 13 and San Francisco 3. 1953. Bul. No. 133.

Infra-Red Drying Studies: Sand and Pine Lumber. By R. E. Wingard and C. N. Searcy. 19 pp. Tables. Alabama Polytechnic Inst., Auburn. 1953. Engin. Bul. No. 19.

Protection

Forest Insect Conditions in California 1953. 13 pp. Illus. California Forest Pest Control Action Council, Sacramento. 1954.

Larch Sawfly Conditions in the Lake States in 1953; A Reconnaissance Survey. By L. C. Beckwith. 6 pp. Lake States Forest Expt. Sta., St. Paul, Minn. 1954. Misc. Rept. No. 25. Mimeog.

The Prevention of Borer Attacks on Hoop Pine Logs. By A. R. Brimblecombe. 37 pp. Illus. Queensland Forest Serv., Brisbane. 1953. Bul. No. 15.

A Summary of Current Forest Pest Problems for New York State 1953-54. Comp. by The Committee on Insects and Diseases, Society of American Foresters New York Section Winter 1953-54. Tree Pest Info. Serv., State Univ. of New York College of Forestry, Syracuse 10. Mimeog.

Range Management

Performance of Weeping Lovegrass under Different Management Practices. By C. E. Denman and others. 18 pp. Okla. Agric. Expt. Sta., Stillwater, Tech Bul. No. T-48. October 1953.

Veld Types of South Africa. By J. P. H. Acocks. 192 pp. Maps. Dept. of Agric., Union of South Africa, Pretoria. Botanical Survey Memoir No. 28. 1953. 20 shillings.

Silviculture

The Effects of Forest Fires on the Vegetation of Interior Alaska. By H. J. Lutz. 36 pp. Illus. Alaska Forest Research Center, Juneau. 1953. Station Paper No. 1. Processed.

Forest Planting in New York. By E. W. Littlefield. 22 pp. Illus. New York State Conserv. Dept., Albany. 1953. Forestry Bul. No. 2 revised.

How to Kill Woody Plants; Brush Killer's Tool Kit. Illus. Univ. of Missouri and Central States Forest Expt. Sta., Columbia. 1954. Folder No. 26.

Jalot Lehtipuumme Luontaisina ja Viljeltyinä (Some of the Southern Broad-Leaved Trees in Finland, Naturally Grown and Cultivated). By P. J. Ollinmaa. 73 pp. Soc. of Forestry in Finland, Helsinki. 1952. Silva Fennica No. 77.

Severe Burning Treatment Tested on Lowland Pine Sites. By S. Little and E. B. Moore. 11 pp. Northeastern Forest Expt. Sta., Upper Darby, Pa. 1953. Station Paper No. 64.

Wood Technology and Utilization

Beech for Containers. By D. B. Cook. 13 pp. Northeastern Forest Expt. Sta., Upper Darby, Pa. 1953. Beech Util. Ser. No. 7.

Directory of Wood-Using Industries in the Upper Peninsula of Michigan. 20 pp. Michigan Dept. of Conserv., Lansing 26. 1953.

Fabrication and Design of Glued Laminated Wood Structural Members. By A. D. Freas and M. L. Selbo. 220 pp. Illus. U. S. Dept. of Agric., Washington 25, D. C. 1954. Tech. Bul. No. 1069. 60 cents.

The Manufacture of Wood Charcoal in Great Britain. By L. Reynolds. 12 pp. Illus. Great Britain Forestry Comm., London. 1953. Forest Record No. 19. 1s. 3d.

Use and Manufacture of Wood Flour. By L. Reynolds. 5 pp. Great Britain Forestry Comm., London. 1953. Forest Record No. 21. 6d.

Utilisation Notes on South African Timbers. By M. H. Scott. 95 pp. Union of South Africa Dept. of Forestry, Pretoria. 1953. Bul. No. 36. 1s.

Society Affairs

Officers and Members of the Council, 1954-1955

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Asheville, N. C.

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Woodlands Department
Kimberly-Clark Corporation
Neenah, Wis.

C. Huxley Coulter
Florida Forest Service
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Stanley G. Fontanna
School of Natural Resources
University of Michigan
Ann Arbor, Mich.

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Federal Building
Missoula, Mont.

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Weyerhaeuser Timber Company
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Henry Clepper, *Executive Secretary*
Mills Building, 17th Street at Pennsylvania Avenue, N. W.
Washington, D. C.

Joseph S. Illick
State University of New York
College of Forestry
Syracuse 10, N. Y.

J. Herbert Stone
U. S. Forest Service
Post Office Building
Portland 8, Ore.

Rutherford H. Westveld
Department of Forestry
University of Missouri
Columbia, Mo.

Coming Events

Forest Products Research Society

The 1954 meeting of the Forest Products Research Society will be held in Grand Rapids, Mich., May 5, 6, and 7, under the direction of Fred E. Dickenson, national meeting chairman.

Gulf States Section

The Gulf States Section will hold its spring meeting at Alexandria, May 6-7.

Washington Section

The special meeting of the Washington Section held once a year in the Pinchot home will be on the evening of May 27.

Kentucky-Tennessee Section

The annual meeting of the Kentucky-Tennessee Section will be held May 21-22 at Berea College, Ky.

Annual Field Meeting, Inland Empire Section

The 1954 field meeting of the Inland Empire Section will be held at Santa, Idaho on May 22. The program will be under the sponsorship of the Section's Small Woodlands Management Committee and will feature farm forestry demonstrations.

Allegheny Section

The summer meeting of the Allegheny Section will be held at Mont Alto, Pa., June 11-12.

American Forestry Association

The annual meeting of the American Forestry Association will be held at the Multnomah Hotel, Portland, Ore., September 6-9.

Society of American Foresters

Annual meeting, Hotel Schroeder, Milwaukee 3, Wis., October 24-27.

The Society's Dollar

Where It Comes From	*Cents*
Journal subscriptions and Journal sales	7.6
Member dues and admission fees	71.6
Advertising (gross income; not net)	19.5
All other income	1.3
Total	100.0
Where It Goes	
Journal of Forestry	56.8
Services to the Council, Sections, Divisions, Committees	5.1
Professional and technical services	2.2
Professional and public relations	2.7
General administration; membership services; elections, records	33.2
Total	100.0

The President's Column

E. L. Demmon

In the March issue of the Journal, opposite my column on page 216, there was published a table showing the Society's expense and income for 1952 and 1953 together with the budget for 1954.

This month I want to tell you more about our fiscal situation. But since financial statements often make dull reading, I have simplified the information. Briefly, I want to discuss the Society's dollar: where it comes from, and where it goes.

The analysis is based on total income for 1953 of $117,758 and total expense of $115,570.

The four categories of income are self-explanatory. And it is sufficient to note that the major share of our income is from membership dues. The five categories of expense may not be as easily understood, hence the following brief descriptions may help members to better visualize the Society's activities.

These activities fall into five broad fields:

1. Journal of Forestry.

2. Services rendered to the Council, Sections, Divisions, Committees, and Chapters. These services include the

collection of dues for the Sections; the maintenance of the *Section Manual;* assistance, financial and otherwise, to the 11 subject Divisions in the conduct of their business and meetings; maintenance of rosters of Division and Section officers, and of Committees, and maintenance of permanent records of their activities.

3. Professional and technical services include just about everything the Society is asked to do for the individual member. One of the most important of these is serving as a clearing house for information not readily obtainable by members elsewhere. The facilities of the Society are available to members for any appropriate purpose, and the number and variety of requests are increasing. This is a type of service that the Society's executive staff especially likes to render.

4. Professional and public relations include those many activities carried on for the purpose of disseminating information about the Society and the forestry profession. Cooperative relations with other scientific, professional, and technical organizations are maintained by participation in their activities and they in ours. For example, the Society has long been represented on the Council of the American Association for the Advancement of Science, the National Research Council's Division of Biology and Agriculture, the Agricultural Research Institute, the American Institute of Biological Sciences, and similar bodies. I myself have enjoyed the privilege of representing the Society on the first three groups just mentioned. At the same time the Society has enjoyed cordial working relations with trade associations, with associations for the conservation of natural resources, and with numerous educational groups.

5. General administrative services, as the name implies, cover the "housekeeping" activities essential to the functioning of the Society. These include so many things that space permits mention of only a few. For example, membership applications, advancements, and terminations processed last year totalled about 1,500. Election of applicants to membership involves considerable detail work. Extreme care is used in checking each application so that membership standards may be maintained. A membership list is prepared semiannually—oftener, if requested—for each Sec-

R. Lynn Emerick (1885-1954)

Ralph Lynn Emerick of Elizabethtown, Pa., died March 23. Until his retirement in 1947 he had served for eleven years as chief of the Bureau of Forests, Pennsylvania Department of Forests and Waters.

Born in Rebersburg, Pa., November 15, 1885, Mr. Emerick taught public school before entering the Pennsylvania State Forest Academy at Mont Alto, where he was graduated in 1909. He immediately joined the State Department of Forestry.

In this department he served continuously for 37 years in various field assignments; from 1925 onward in the headquarters office in Harrisburg. He was chief of the Bureau of Research and Information until 1935 when he was appointed chief of the Bureau of Forests, a position then comparable to that of state forester.

Mr. Emerick was the subject of a "We Present" sketch in the JOURNAL OF FORESTRY for October, 1946, in which biographical article his career was reported in detail. He was chairman of the S.A.F. Allegheny Section in 1941, and served on several national Society committees.

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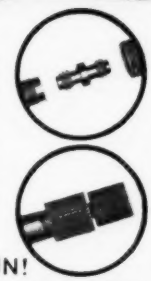

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tion. In fact, just keeping an up-to-date list of our members with their correct addresses is a formidable job. I was astonished to learn that ten percent of our members change their addresses *every month*.

Until one has served on the Council of the Society he has little conception of the numerous ramifications involved in running an organization with nearly 10,000 members who function through 11 Divisions, 21 Sections, and 60 Chapters, not counting more than 100 national and Section committees. I have been impressed by the great increase in Society activities since I first served on the Council back in 1932. The Society is a business as well as a body of professional people, and its business operations should be of interest to all members. That's why this month's column was written.

More later.

E. L. Demmon

Metropolitan Chapter Honors A. B. Recknagel, Elects New Officers

Arthur B. Recknagel's retirement on December 31 from the St. Regis Paper Co. occasioned a testimonial dinner in his honor by the Metropolitan Chapter, New York Section, on January 6. With a nationally known career as a forester, educator, and articulate spokesman for the profession, Mr. Recknagel came downstate for the dinner and fellowship from Deferiet, where he has been directing St. Regis' forest management program in northern New York.

The event also marked resumption of chapter activity drawing on S.A.F. members in northern New Jersey, Long Island, and other areas of and near Greater New York.

The group elected new officers: chairman, Donald M. Rochester, secretary of Community Relations Committee of American Paper and Pulp Assn., 122 E. 42nd St., New York City; and secretary-treasurer, James B. Carlaw, Woodlands Dept., International Paper Co., 220 E. 42nd St., New York City.

Julius Kahn arranged the dinner and meeting, presided, and gave a tribute of respect and affection for Mr. Recknagel on behalf of the entire chapter.

R. R. Blumenstein Succeeds H. B. McKean as Associate Editor

Robert R. Blumenstein has been appointed by S.A.F. President Demmon to serve as associate editor for *Forest and Wood Utilization* on the editorial board of the JOURNAL OF FORESTRY. He succeeds Herbert B. McKean, who resigned that assignment when assuming his new duties with Potlatch Forests Inc., Lewiston, Idaho.

Mr. Blumenstein, who assumed his duties in March, is manager of the Timber Engineering Company Laboratory, Washington, D. C., which position he has held since May 1944. Prior to joining the staff of TECO, he was supervisor of preservative treatments, Wood Preserving Division, Koppers Company, Newport, Delaware.

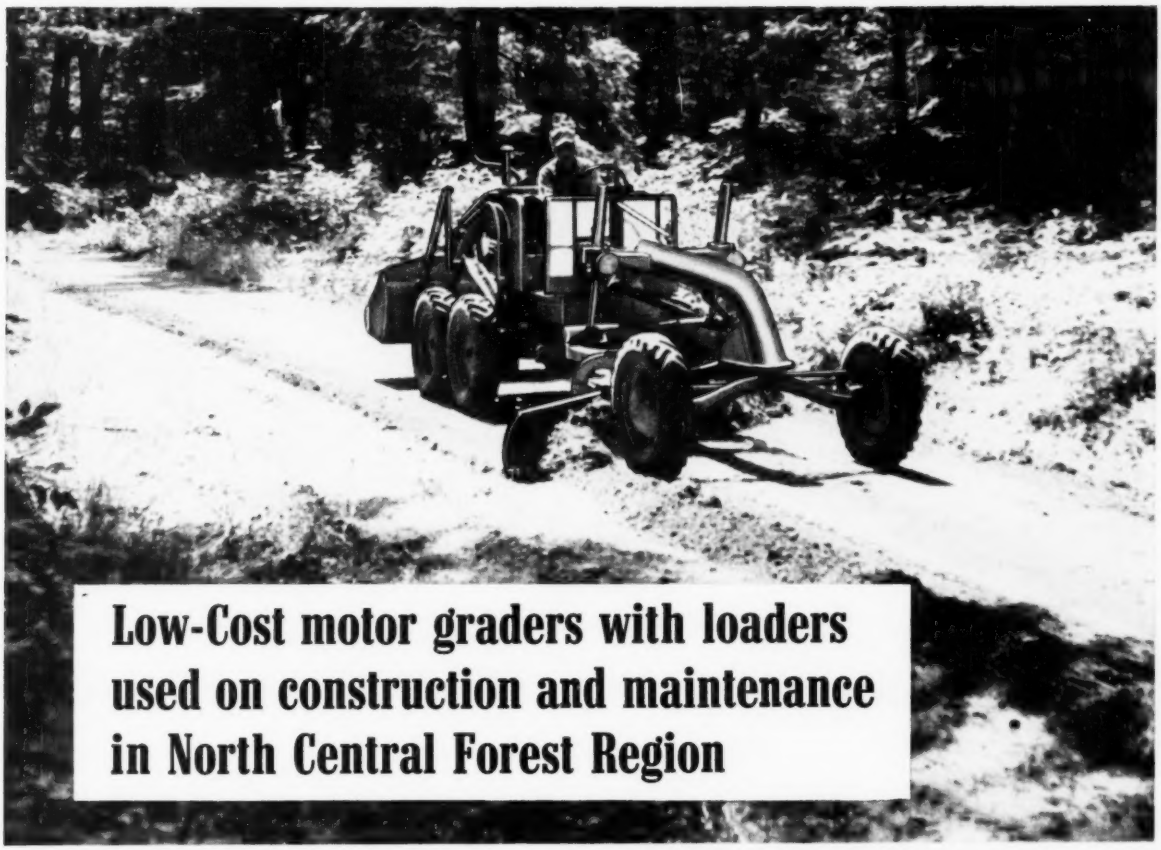
ROBERT R. BLUMENSTEIN

Mr. Blumenstein received his B.S. degree in forestry from Pennsylvania State College in 1940. He is a member of the Forest Products Research Society as well as the S.A.F. He has written and edited numerous technical reports, has contributed to various trade journals, and was editor for the Wood Utilization Section of the forthcoming *Forester's Manual*.

Herbert B. McKean, the retiring associate editor, has served on the editorial board of the JOURNAL since January 1946. The JOURNAL, on behalf of its staff and the Society as a whole, extends to Dr. McKean heartiest thanks for his years of capable and energetic contribution as associate editor.

S. A. F and C I. F. Commended by Chamber of Commerce

Samuel S. Ericsson, secretary, U. S. Section, Canadian-United States Committee of the Chamber of Commerce of the United States, has advised the S.A.F. of a statement issued by his committee and approved by the Board of Directors of the U. S. Chamber as follows:



Low-Cost motor graders with loaders used on construction and maintenance in North Central Forest Region

This Model D Motor Grader works in the Ottawa National Forest, handles maintenance of more than 115 miles of access roads and fire lanes, ditching, excavation for culverts and a variety of material handling jobs.

A substantial portion of the road and fire lane construction and maintenance in four of the National Forests of the North Central Forest Region is carried out with Allis-Chalmers Model D Motor Graders.

In most cases, each of these graders is assigned to more than 100 miles of access and travel roads in one or more ranger districts. Equipped with rear-end loaders, they are also used for loading gravel, lifting fallen trees, digging out embankment, moving rock, and handling other materials such as cinders and blacktop.

Handles Variety of Work

These Model D's are stationed in the Ottawa, Superior, Nicolet, and Chippewa National Forests. In the Ottawa National Forest, having a gross area of 1,742,971 acres, the Model D is assigned to the Watersmeet Ranger District. Working from this headquarters station, the grader handles maintenance of more than 115 miles of essential access roads and fire lanes, also ditching, excavation for major and small culverts and a wide variety of material handling.

Has Lots of Faith in "D"

The operator of this machine travels from the Watersmeet Station to the grader and back each day by Forest Service truck. From the time he starts using the machine in the morning until he leaves it at the end of the day, he is alone with the Model D in the depths of the Ottawa National Forest.

"You've got to have a lot of faith in a machine to work forest roads," he said. "I've learned the Model D Motor Grader is a good machine and will do a lot of work. I often have to move a full load up a 25 percent grade with sharp curves. This Model D will do it. It is also surprising how this motor grader will take the rock conditions along the lanes and roads in this area. But what I really like most about the "D" is the way she can load. That rear-end loader can handle a lot of material."

* * *

Low in first cost as well as operating cost, Model D Graders stretch equipment budgets, so that several of these machines can be strategically spotted to multiply both the amount of work done and the area served. Their ability and versatility proved by thousands in service, Model D's now have even greater working ability through the dynamic new 50-hp POWER-CRATER engine.

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FISCAL YEAR MEMBERSHIP CAMPAIGN
SECTION BOX SCORE

Section	Proposed 1954 quota	Applications Received[1] May listing	Total fiscal year
Allegheny	100	7	35
Appalachian	100	6	37
Central Rocky Mountain	45	1	17
Central States	110	12	65
Columbia River	140	11	35
Gulf States	105	20	36
Inland Empire	30	11	24
Intermountain	30	2	11
Kentucky Tennessee	30	2	3
New England	95	6	43
New York	65	8	26
Northern California	120	2	29
Northern Rocky Mountain	30	15	28
Ozark	55	4	29
Puget Sound	80	11	41
Southeastern	145	11	95
Southern California	20	1	2
Southwestern	35	2	6
Upper Mississippi Valley	60	7	53
Washington	45	0	6
Wisconsin Upper Michigan	60	1	1
Total	1,500	140	622

[1]Student, Junior, Affiliate, Associate (initial) grades only.

FISCAL YEAR MEMBERSHIP CAMPAIGN
SCHOOL BOX SCORE

School	Student Applications Received May listing	Total fiscal year
Alabama Polytechnic Institute	1	6
University of California	0	19
Colorado A & M College	0	12
Duke University	2	9
University of Florida	1	16
University of Georgia	2	31
University of Idaho	8	16
Iowa State College	3	26
Louisiana State University	9	14
University of Maine	3	13
University of Massachusetts	0	16
Michigan State College	7	25
University of Michigan	3	12
University of Minnesota	2	19
University of Missouri	0	16
Montana State University	9	17
State University of New York	5	15
North Carolina State College	1	19
Oregon State College	3	15
Pennsylvania State University	5	19
Purdue University	0	18
Utah State Agricultural College	1	8
University of Washington	5	22
West Virginia University	0	6
Yale University	1	2
Total	71	391

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The Canada-United States Committee commends the Canadian Institute of Foresters and the Society of American Foresters for their efforts to attain a higher degree of understanding between the professional foresters of both countries. The Committee believes that these two organizations are the logical bodies to collect and exchange information and collaborate on forestry research. It is further suggested that these views be expressed by the respective National Chambers to the organizations concerned.

Meeting of Division of Forest-Wildlife Management

An open meeting of the Division of Forest-Wildlife Management, held March 9 in Chicago in connection with the 19th North American Wildlife Conference, was attended by 34 members and friends. Dr. Harold Steinhoff of Colorado A & M College acted as chairman in the absence of J. V. K. Wagar.

Interesting and informative discussions covered the following topics:

Progress on Foresters' Manual.—Henry Clepper reported this Society project had been a tremendous job with some 200 individuals contributing material. The manuscript has been submitted to a publisher; a contract will be signed soon.

Survey of Forest Research.—A Rockefeller grant of $30,000 has been made to complete a second study of forest research programs similar to the initial study of 1928. Frank Kaufert and William Cummings are engaged in this study under a 5-man supervising committee. Their report, in book form, will emphasize progress since the first report, where we stand today, and indicate needs for the next 25-year period.

Research in related fields such as forest-wildlife management will be included. Discussion centered on how our group could make this phase of the study more inclusive and effective.

Clepper advised that a similar study was being proposed for forestry education and that he and Hardy Shirley had been appointed to try to secure an $80,000 grant for it.

Coordination of Forest and Wildlife Programs.—This general topic appeared to receive the most interest and consideration and covered both the research and management programs.

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Chemical Treating Converts Waste Thinnings Into Valuable Posts

In the photo above you see a portion of a huge stock pile of fence posts at Statesville Wood Products, Inc., of Statesville, North Carolina. Before Statesville started buying this material and chemically treating it for posts, it was almost worthless inasmuch as it was considered too small to be cut into pulp wood.

A few years ago, Mr. Roy Beck, President of Statesville Wood Products, was unable to find any locust or cedar posts of good quality in his immediate area. He discovered that many of his friends were having the same trouble, so he immediately investigated the possibilities of treating other softer woods with some sort of preservative. After careful consideration, he chose the Osmose Process because of its simplicity and the proven effectiveness of the treatment. Mr. Beck immediately set up a small wood treating plant and was especially pleased with the low initial investment required. Now he treats and stock piles thousands of posts that are readily available in his area at a very economical price.

Mr. Beck is currently planning the installation of another Osmose Wood Treating Plant near Zebulon, North Carolina, where he feels a similar good opportunity is knocking.

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Regarding research needs, Ralph Hill and Paul Hickie outlined the problems—the tendency of foresters to consider only aspects of wildlife research involving animal damage to forests and the excellent opportunities being missed to include certain phases of wildlife research in established forest and range studies. The latter applies primarily to the Forest Service experiment stations where the Fish and Wildlife Service has biologists assigned to research. It was the consensus that the chairman of our Division should arrange for the appointment of a joint committee to include representatives of the Wildlife and Range Management Societies for the purpose of giving further consideration to coordination possibilities and especially to work with Kaufert's Forestry Research Project toward this end.

Actual coordination of wildlife and forestry programs was on a more optimistic note. Arthur Dahl of Wisconsin, William Barnes of Indiana, and Frank Barick of North Carolina described cooperative wildlife-forestry projects which have been initiated on state and county and national forests in their states. The general impression resulting from these presentations was that when wildlife managers and foresters reach the stage of actual joint planning of such cooperative projects, the conflicts are not too serious and can usually be resolved.

The possibilities of including more formal papers on these projects in the Division program of the annual Society meeting in Milwaukee next fall appeared to justify further consideration in view of the interest shown. The possibilities of field trips to such projects in connection with this meeting also warrant consideration.

Program for Annual Meeting.—Ideas for the use of the Division officers in planning the program for the Milwaukee meeting were solicited. Paul Herbert, Michigan State, described oak research and Samuel Graham, University of Michigan, aspen research as examples of studies of a more technical nature which might be considered in view of the importance of these two species to wildlife.

Earl O'Roke, University of Michigan, suggested that three papers on wildlife, range, and timber management be presented to describe their activity with the purpose of securing better correlation in management.

Other Items.—There was active participation by those in attendance in the above discussions. Of special note was Lowell Besley's request for articles of a popular nature for *American Forests* magazine. These could be case history articles, on the order of the series of articles now appearing in this magazine, describing successful multiple use forest management programs.

HERMAN F. OLSON, *Secretary*

Allegheny Section Meeting

The annual winter meeting of the Allegheny Section was held in Baltimore, Md., on February 25, 26, and 27. With registration and committee meetings on Thursday evening, the climax was a showing of the movie *Maryland*.

Following a welcome by Governor Theodore R. McKeldin, the Friday morning meeting was devoted to reforestation. H. C. Buckingham, state forester of Maryland, presented a paper on "Recent Developments in the Production of Planting Stock."

A panel discussion on "Tree Planting in the Allegheny Section" followed. A. C. McIntyre of the Soil Conservation Service was the panel leader, and the participants were Donald G. Cuppett, assistant state forester of West Virginia; Paul M. Felton, Pennsylvania Department of Forests and Waters; W. E. McQuilkin, Northeastern Forest Experiment Station; V. C. Miles, Soil Conservation Service; John J. Mohr, Maryland Department of Forests and Parks; and E. B. Moore, New Jersey Department of Conservation and Economic Development.

Lawrence C. Smack of the New Jersey Department of Conservation and Development followed with a

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THE DISPLAY SHOWN ABOVE recently became a part of the hall decorations in the Forestry Building at the University of Missouri. Its preparation was a project of Tau chapter of Xi Sigma Pi. Ramon Gass carved the Society of American Foresters' emblem and did the art work on the panel to the right which bears the Code of Ethics of the Society. The panel at the left lists at the bottom, past, present and future (in manuscript form or in press) publications of the Society. Professor Lawrence Leney prepared the oak panels. Officers standing from left to right are: F. Bryan Clark, Assistant Forester; Ramon Gass, Secretary-Fiscal Agent; Allen Ryker, Forester; Arthur Cowley, Rangers. All the officers are members of the Society.

paper, "Reforestation—Fact or Fancy", which summarized the findings of a survey of past plantings in New Jersey. Lively discussion followed all the presentations.

The afternoon session was devoted to a business meeting, at which the committee reports were given. Henry Clepper reported on Society affairs, and Bernard Frank of the Washington Section engineered a demonstration of the Hare system of proportional representation under which Society officers are elected.

Section Chairman A. R. Bond was master of ceremonies at the evening banquet, which featured as entertainment "The Old Civil War Character."

Saturday morning saw thirty-five hardy souls embarked on a "naval" tour of Baltimore Harbor, provided by the city's port department, while the balance visited the Peters Lumber Co., for an explanation of the use of lumber in loading ship's cargo, and followed a tour of the Baltimore and Ohio Railroad's Museum of Transportation.

New Section officers elected were Austin N. Lentz, chairman; Arthur L. Bennett, vice-chairman; William A. Parr, secretary-treasurer; and Dr. W. C. Bramble and Silas Little, members of the Executive Committee.

The summer meeting was scheduled for Mont Alto, Pa., June 10-12, 1954.

Natural Areas

The demand for the listing of forest types protected in approved Natural Areas as compiled by the Committee on Natural Areas of the Society of American Foresters, and published in the JOURNAL OF FORESTRY, Volume 47, No. 2, February 1949, has proven to be greater than anticipated. The Committee has been unable to supply requests for this listing for nearly a year.

Furthermore, since 1949, additional Natural Areas have been approved by the Committee. Likewise a few Natural Areas have been withdrawn from the approved list.

Moreover, the Committee on Forest Cover Types has recently revised the numbering and terminology of many of the eastern types, which changes are reflected in the publication *Forest Cover Types of North America.*

Accordingly, the Committee on Natural Areas has deemed it essential to reissue the listing. The following *Forest Cover Types Protected Within Natural Areas* represent the latest information available to the Committee as of December 1, 1953, and supercedes the original list published in 1949. Type numbers and names are in accordance with the *Forest Cover Types of North America.*

JOHN F. SHANKLIN, *Chairman*
Committee on Natural Areas

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FOREST TYPES PROTECTED WITHIN NATURAL AREAS

As approved by the Committee on Natural Areas, Society of American Foresters, December 1, 1953

S.A.F. type No.	Name of forest cover type	Name of natural area	Area of type	Total of natural area	State	County	Protection agency	Administration unit
			Acres	*Acres*				
			Eastern types					
1.	Jack pine	Keeley Creek	420	640	Minn.	Lake	F.S.	Superior N.F.
		Lac La Croix	28	973	Minn.	St. Louis	F.S.	Superior N.F.
		Moquah	497	640	Wis.	Bayfield	F.S.	Chequamegon N.F.
		Necedah	100	100	Wis.	Juneau	F.W.S.	Necedah N.W.R.
		Sunken Lake	77	640	Minn.	Itasca	F.S.	Chippewa N.F.
2.	Black spruce—white spruce							
3.	Jack pine—paper birch							
4.	White spruce—balsam fir							
5.	Balsam fir	Lac La Croix	36	973	Minn.	St. Louis	F.S.	Superior N.F.
6.	Jack pine—black spruce							
7.	Black spruce—balsam fir							
8.	Jack pine—aspen							
9.	White spruce—balsam fir—aspen							
10.	Black spruce—aspen							
11.	Aspen—paper birch							
12.	Black spruce	Lac La Croix	39	973	Minn.	St. Louis	F.S.	Superior N.F.
		Pine Point	18	1,176	Minn.	Cass	F.S.	Chippewa N.F.
		Keeley Creek	146	640	Minn.	Lake	F.S.	Superior N.F.
		Sunken Lake	13	640	Minn.	Itasca	F.S.	Chippewa N.F.
13.	Black spruce—tamarack							
14.	Northern pin oak							
15.	Red pine	Pine Point	261	1,176	Minn.	Cass	F.S.	Chippewa N.F.
		Lac La Croix	208	973	Minn.	St. Louis	F.S.	Superior N.F.
		Seney	100	500	Mich.	Schoolcraft	F.W.S.	Seney N.W.R.
		Sunken Lake	156	640	Minn.	Itasca	F.S.	Chippewa N.F.
16.	Aspen	Pine Point	310	1,176	Minn.	Cass	F.S.	Chippewa N.F.
		Lac La Croix	214	973	Minn.	St. Louis	F.S.	Superior N.F.
		Sunken Lake	70	640	Minn.	Itasca	F.S.	Chippewa N.F.
17.	Pin cherry	Black Mountain	13	1,405	N. C.	Yancey	F.S.	Pisgah N.F.
18.	Paper birch	Sunken Lake	171	640	Minn.	Itasca	F.S.	Chippewa N.F.
		The Bowl	16	510	N. H.	Grafton	F.S.	White Mountain N.F.
19.	Gray birch—red maple							
20.	White pine—northern red oak—white ash							
21.	White pine	Little Laurel Run	45	2,092	Va.	Rockingham	F.S.	George Washington N.F.
		Ramsey's Draft	85	1,794	Va.	Augusta	F.S.	George Washington N.F.
		Pine Point	42	1,176	Minn.	Cass	F.S.	Chippewa N.F.
		Lac La Croix	232	973	Minn.	St. Louis	F.S.	Superior N.F.
		Barre Woods	20	130	Mass.	Worcester	H.U.	Harvard Forest

S.A.F. type	Name of forest cover type	Name of natural area	Area of type	Total of natural area	State	County	Protection agency	Administration unit
No.			*Acres*	*Acres*				
22.	White pine—hemlock	Seney	50	500	Mich.	Schoolcraft	F.W.S.	Seney N.W.R.
23.	Hemlock	Little Laurel Run	127	2,092	Va.	Rockingham	F.S.	George Washington N.F.
		Ramsey's Draft	179	1,794	Va.	Augusta	F.S.	George Washington N.F.
		Rock Creek	176	190	Ky.	Laurel	F.S.	Cumberland N.F.
		Tionesta	2,113	2,113	Pa.	McKean	F.S.	Allegheny N.F.
		Pisgah	20	20	N. H.	Cheshire	H.U.	Harvard Forest
		Barre Woods	20	130	Mass.	Worcester	H.U.	Harvard Forest
24.	Hemlock—yellow birch							
25.	Sugar maple—beech—yellow birch	The Bowl	92	510	N. H.	Grafton	F.S.	White Mountain N.F.
		Black Mountain	126	1,405	N. C.	Yancey	F.S.	Pisgah N.F.
		Seney	350	500	Mich.	Schoolcraft	F.W.S.	Seney N.W.R.
		Upper Peninsula	126	233	Mich.	Marquette	F.S.	Upper Peninsula Exp. F.
26.	Sugar maple—basswood							
27.	Sugar maple							
28.	Black cherry—sugar maple							
29.	Black cherry							
30.	Red spruce—yellow birch	The Bowl	107	510	N. H.	Grafton	F.S.	White Mountain N.F.
31.	Red spruce—sugar maple—beech	Moosehorn	100	100	Maine	Washington	F.W.S.	Moosehorn N.W.R.
		The Bowl	20	510	N. H.	Grafton	F.S.	White Mountain N.F.
32.	Red spruce	The Bowl	220	510	N. H.	Grafton	F.S.	White Mountain N.F.
33.	Red spruce—balsam fir							
34.	Red spruce—Fraser ("Southern balsam") fir	Black Mountain	542	1,405	N. C.	Yancey	F.S.	Pisgah N. F.
35.	Paper birch—red spruce—balsam fir							
36.	White spruce—balsam fir—paper birch							
37.	Northern white-cedar	Upper Peninsula	45	233	Mich.	Marquette	F.S.	Upper Peninsula Exp. F.
		Sunken Lake	19	640	Minn.	Itasca	F.S.	Chippewa N.F.
38.	Tamarack	Pine Point	15	1,176	Minn.	Cass	F.S.	Chippewa N.F.
		Keeley Creek	20	640	Minn.	Lake	F.S.	Superior N.F.
		Rice Lake	200	200	Minn.	Aitkin	F.W.S.	Rice Lake N.W.R.
39.	Black ash—American elm—red maple	Upper Peninsula	57	233	Mich.	Marquette	F.S.	Upper Peninsula Exp. F.
40.	Post oak—black oak	Kentucky	100	200	Ky.	Lyon	F.W.S.	Ky. Woodlands N.W.R.
41.	Scarlet oak							
42.	Bur oak	Pine Point	13	1,176	Minn.	Cass	F.S.	Chippewa N.F.
43.	Bear oak	Ramsey's Draft	16	1,794	Va.	Augusta	F.S.	George Washington N.F.
44.	Chestnut oak	Little Laurel Run	1,769	2,092	Va.	Rockingham	F.S.	George Washington N.F.
		Black Mountain	229	1,405	N. C.	Yancey	F.S.	Pisgah N.F.
		Ramsey's Draft	368	1,794	Va.	Augusta	F.S.	George Washington N.F.
45.	Pitch pine	Ramsey's Draft	210	1,794	Va.	Augusta	F.S.	George Washington N.F.
		Little Laurel Run	89	2,092	Va.	Rockingham	F.S.	George Washington N.F.

S.A.F. type No.	Name of forest cover type	Name of natural area	Area of type Acres	Total of natural area Acres	State	County	Protection agency	Administration unit
46.	Eastern redcedar							
47.	Eastern redcedar—pine							
48.	Eastern redcedar—hardwood							
49.	Eastern redcedar—pine—hardwood							
50.	Black locust							
51.	White pine—chestnut oak							
52.	White oak—red oak—hickory							
53.	White oak	Kentucky	100	200	Ky.	Trigg	F.W.S.	Ky. Woodlands N.W.R.
54.	Northern red oak—basswood—white ash	Ramsey's Draft	53	1,794	Va.	Augusta	F.S.	George Washington N.F.
		Barre Woods	20	130	Mass.	Worcester	H.U.	Harvard Forest
55.	Northern red oak							
56.	Northern red oak—mockernut hickory—sweetgum							
57.	Yellow-poplar							
58.	Yellow-poplar—hemlock	Little Laurel Run	62	2,092	Va.	Rockingham	F.S.	George Washington N.F.
59.	Yellow-poplar—white oak—northern red oak	Indiana Pioneer Mothers' Memorial	62	88	Ind.	Orange	F.S.	Wayne-Hoosier N.F.
60.	Beech—sugar maple	Indiana Pioneer Mothers' Memorial	26	88	Ind.	Orange	F.S.	Wayne-Hoosier N.F.
		Warren Woods	196	196	Mich.	Berrien	State	Warren Woods S.P.
61.	River birch—sycamore							
62.	Silver maple—American elm							
63.	Cottonwood							
64.	Sassafras—persimmon							
65.	Pin oak—sweetgum							
66.	Ashe juniper ("mountain cedar")							
67.	Mohrs oak (shin oak)							
68.	Mesquite							
69.	Sand pine							
70.	Longleaf pine	Blackbeard Island	300	300	Ga.	McIntosh	F.W.S.	Blackbeard Island N.W.R.
71.	Longleaf pine—scrub oak							
72.	Southern scrub oak							
73.	Southern redcedar							
74.	Sand live oak—cabbage palmetto	Cape Romain	500	1,000	S. C.	Charleston	F.W.S.	Cape Romain N.W.R.
75.	Shortleaf pine	Rock Creek	14	190	Ky.	Laurel	F.S.	Cumberland N.F.
76.	Shortleaf pine—oak							

S.A.F. type No.	Name of forest cover type	Name of natural area	Area of type Acres	Total of natural area Acres	State	County	Protection agency	Administration unit
77.	Shortleaf pine—Virginia pine							
78.	Virginia pine—southern red oak							
79.	Virginia pine							
80.	Loblolly pine—shortleaf pine	Piedmont	118	138	Ga.	Jones	F.W.S.	Piedmont N.W.R.
		Chincoteague	200	200	Va.	Accomac	F.W.S.	Chincoteague N.W.R.
81.	Loblolly pine	Piedmont	20	138	Ga.	Jones	F.W.S.	Piedmont N.W.R.
		Mattamuskeet	75	75	N. C.	Hyde	F.W.S.	Mattamuskeet N.W.R.
82.	Loblolly pine—hardwood	Cape Romain	500	1,000	S. C.	Charleston	F.W.S.	Cape Romain N.W.R.
83.	Longleaf pine—slash pine	Osceola	323	998	Fla.	Baker	F.S.	Osceola N.F.
84.	Slash pine	Osceola	207	998	Fla.	Baker	F.S.	Osceola N.F.
		St. Marks	300	400	Fla.	Wakulla	F.W.S.	St. Marks N.W.R.
85.	Slash pine—hardwood							
86.	Cabbage palmetto—slash pine	St. Marks	100	400	Fla.	Wakulla	F.W.S.	St. Marks N.W.R.
87.	Sweetgum—yellow poplar							
88.	Laurel oak—willow oak							
89.	Live oak							
90.	Beech—southern magnolia							
91.	Swamp chestnut oak—cherry bark oak							
92.	Sweetgum—Nuttall oak—willow oak	Noxubee	100	200	Miss.	Oktibbeha	F.W.S.	Noxubee N.W.R.
		Noxubee	100	200	Miss.	Noxubee	F.W.S.	Noxubee N.W.R.
93.	Sugarberry—American elm—green ash	Delta Purchase Unit	40	140	Miss.	Sharkey	F.S.	Mississippi N.F.'s
94.	Sycamore—pecan—American elm							
95.	Black willow							
96.	Overcup oak—water hickory	Delta Purchase Unit	100	140	Miss.	Sharkey	F.S.	Mississippi N.F.'s
		White River	600	600	Ark.	Phillips	F.W.S.	White River N.W.R.
97.	Atlantic white-cedar	Juniper Bay	10	20	S. C.	Sumter	State	Manchester S.F.
98.	Pond pine	Osceola	18	998	Fla.	Baker	F.S.	Osceola N.F.
99.	Slash pine—swamp tupelo							
100.	Pond cypress							
101.	Baldcypress	Osceola	109	998	Fla.	Baker	F.S.	Osceola N.F.
		Big Lake	500	500	Ark.	Mississippi	F.W.S.	Big Lake N.W.R.
		Okefenokee	15,000	17,500	Ga.	Charlton	F.W.S.	Okefenokee N.W.R.
102.	Baldcypress—water tupelo							
103.	Water tupelo	Osceola	341	998	Fla.	Baker	F.S.	Osceola N.F.
		Okefenokee	2,500	17,500	Ga.	Charlton	F.W.S.	Okefenokee N.W.R.
104.	Sweetbay—swamp tupelo—red maple							

S.A.F. type	Name of forest cover type	Name of natural area	Area of type	Total of natural area	State	County	Protection agency	Administration unit
No.			*Acres*	*Acres*				
105.	Mahogany							
106.	Mangrove							
			Western types					
201.	White spruce							
202.	White spruce—birch							
203.	Poplar—birch							
204.	Black spruce							
205.	Mountain hemlock—subalpine fir							
206.	Engelmann spruce—subalpine fir	Snowy Range	739	771	Wyo.	Albany	F.S.	Medicine Bow N.F.
		Hurricane Canyon	30	520	Colo.	Teller	F.S.	Pike N.F
		Canyon Creek	379	1,034	Idaho	Bonner	F.S.	Kaniksu N.F.
		Gothic	509	904	Colo.	Gunnison	F.S.	Gunnison N.F.
		San Francisco Peaks	350	880	Ariz.	Coconino	F.S.	Coconino N.F.
		Saddle Mountain	280	500	Colo.	Park	F.S.	Pike N.F.
207.	Red fir							
208.	Whitebark pine	Harvey Munroe Hall	475	4,250	Cal.	Mono	F.S.	Inyo N.F.
		Canyon Creek	50	1,034	Idaho	Bonner	F.S.	Kaniksu N.F.
209.	Bristlecone pine	White Mountain	1,120	2,330	Cal.	Inyo	F.S.	Inyo N.F.
210.	Interior Douglas fir	Coram	175	811	Mont.	Flathead	F.S.	Flathead N.F.
		Canyon Creek	14	1,034	Idaho	Bonner	F.S.	Kaniksu N.F.
		Hurricane Canyon	354	520	Colo.	Teller	F.S.	Pike N.F.
		Santa Catalina	40	4,464	Ariz.	Pima	F.S.	Coronado N.F.
		Oak Creek Canyon	40	940	Ariz.	Coconino	F.S.	Coconino N.F.
		San Francisco Peaks	350	880	Ariz.	Coconino	F.S.	Coconino N.F.
		Monument Canyon	60	640	N. Mex.	Sandoval	F.S.	Santa Fe N.F.
		Butterfly Peak	100	1,000	Ariz.	Pima	F.S.	Coronado N.F.
		Cliff Lake	300	2,301	Mont.	Madison	F.S.	Beaverhead N.F.
211.	White fir	Persia M. Robinson	420	640	Ore.	Wasco	F.S.	Mt. Hood N.F.
212.	Larch—Douglas fir	Ochoco Divide	907	1,920	Ore.	Wheeler	F.S.	Ochoco N.F.
		Coram	605	811	Mont.	Flathead	F.S.	Flathead N.F.
		Canyon Creek	12	1,034	Idaho	Bonner	F.S.	Kaniksu N.F.
		Pend Oreille	200	200	Wash.	Stevens	F.W.S.	Little Pend Oreille N.W.R.
213.	Grand fir—larch—Douglas fir	Metolius	125	1,440	Ore.	Jefferson	F.S.	Deschutes N.F.
214.	Ponderosa pine—larch—Douglas fir	Pringle Falls	300	1,160	Ore.	Deschutes	F.S.	Deschutes N.F.
		Black's Mt. Exp. F.	519	519	Cal.	Lassen	F.S.	Lassen N.F.
		Meeks Table	21	68	Wash.	Yakima	F.S.	Snoqualmie N.F.
215.	Western white pine	Tepee Creek	184	746	Idaho	Bonner	F.S.	Kaniksu N.F.
		Montford Creek	299	335	Idaho	Kootenai	F.S.	Coeur d'Alene N.F.
		Coram	21	811	Mont.	Flathead	F.S.	Flathead N.F.
		Canyon Creek	313	1,034	Idaho	Bonner	F.S.	Kaniksu N.F.
216.	Blue spruce							

S.A.F. type No.	Name of forest cover type	Name of natural area	Area of type Acres	Total of natural area Acres	State	County	Protection agency	Administration unit
217.	Aspen	Narraguinnep	114	2,800	Colo.	Dolores	F.S.	San Juan N.F.
		San Francisco Peaks	100	880	Ariz.	Coconino	F.S.	Coconino N.F.
		Saddle Mountain	110	500	Colo.	Park	F.S.	Pike N.F.
		Cliff Lake	32	2,301	Mont.	Madison	F.S.	Beaverhead N.F.
218.	Lodgepole pine	Pringle Falls	600	1,160	Ore.	Deschutes	F.S.	Deschutes N.F.
		Harvey Munroe Hall	800	4,250	Cal.	Mono	F.S.	Inyo N.F.
		Canyon Creek	47	1,034	Idaho	Bonner	F.S.	Kaniksu N.F.
		Cliff Lake	1,034	2,301	Mont.	Madison	F.S.	Beaverhead N.F.
		Red Rock	60	60	Mont.	Beaverhead	F.W.S.	Red Rock Lakes N.W.R.
219.	Limber pine	Mt. Goliath	200	320	Colo.	Clear Creek & Park	F.S.	Arapaho N.F.
220.	Rocky Mountain juniper	———	———	———	———	———	———	———
221.	Red alder	Lake 22	15	790	Wash.	Snohomish	F.S.	Mt. Baker N.F.
222.	Black cottonwood—willow	Lake 22	10	790	Wash.	Snohomish	F.S.	Mt. Baker N.F.
223.	Sitka spruce	Quinault	360	1,435	Wash.	Grays Harbor	F.S.	Olympic N.F.
		Neskowin Crest	27	686	Ore.	Tillamook	F.S.	Siuslaw N.F.
224.	Western hemlock	Long Creek	200	640	Wash.	Snohomish	F.S.	Mt. Baker N.F.
		Neskowin Crest	400	686	Ore.	Tillamook	F.S.	Siuslaw N.F.
		Montford Creek	29	335	Idaho	Kootenai	F.S.	Coeur d'Alene N.F.
		Canyon Creek	129	1,034	Idaho	Bonner	F.S.	Kaniksu N.F.
		Quinault	495	1,435	Wash.	Grays Harbor	F.S.	Olympic N.F.
225.	Sitka spruce—western hemlock	Quinault	280	1,435	Wash.	Grays Harbor	F.S.	Olympic N.F.
		Neskowin Crest	259	686	Ore.	Tillamook	F.S.	Siuslaw N.F.
226.	Pacific silver fir—hemlock	Lake 22	80	790	Wash.	Snohomish	F.S.	Mt. Baker N.F.
		Long Creek	120	640	Wash.	Snohomish	F.S.	Mt. Baker N.F.
227.	Western redcedar—western hemlock	Lake 22	455	790	Wash.	Snohomish	F.S.	Mt. Baker N.F.
		Long Creek	240	640	Wash.	Snohomish	F.S.	Mt. Baker N.F.
		North Fork Nooksack	437	1,352	Wash.	Whatcom	F.S.	Mt. Baker N.F.
228.	Western redcedar	Cedar Flats	220	680	Wash.	Skamania	F.S.	Gifford Pinchot N.F.
		Lake 22	40	790	Wash.	Snohomish	F.S.	Mt. Baker N.F.
		Wind River	40	1,100	Wash.	Skamania	F.S.	Gifford Pinchot N.F.
229.	Pacific Douglas fir	Port Orford cedar	322	1,133	Ore.	Coos	F.S.	Siskiyou N.F.
		Cedar Flats	400	680	Wash.	Skamania	F.S.	Gifford Pinchot N.F.
		Quinault	60	1,435	Wash.	Grays Harbor	F.S.	Olympic N.F.
		Wind River	365	1,100	Wash.	Skamania	F.S.	Gifford Pinchot N.F.
		North Fork Nooksack	482	1,352	Wash.	Whatcom	F.S.	Mt. Baker N.F.
		Persia M. Robinson	80	640	Ore.	Wasco	F.S.	Mt. Hood N.F.
230.	Douglas fir—western hemlock	Wind River	695	1,100	Wash.	Skamania	F.S.	Gifford Pinchot N.F.
		North Fork Nooksack	296	1,352	Wash.	Whatcom	F.S.	Mt. Baker N.F.
		Long Creek	40	640	Wash.	Snohomish	F.S.	Mt. Baker N.F.
		Quinault	240	1,435	Wash.	Grays Harbor	F.S.	Olympic N.F.
231.	Port Orford cedar—Douglas-fir	Port Orford cedar	811	1,133	Ore.	Coos	F.S.	Siskiyou N.F.
		Coquilla River Falls	500	500	Ore.	Coos	F.S.	Siskiyou N.F.
		Lobster Creek	1,205	1,340	Ore.	Curry	F.S.	Siskiyou N.F.
232.	Redwood	———	———	———	———	———	———	———
233.	Oregon white oak	———	———	———	———	———	———	———
234.	Oak—madrone	Lobster Creek	135	1,340	Ore.	Curry	F.S.	Siskiyou N.F.

S.A.F. type	Name of forest cover type	Name of natural area	Area of type	Total of natural area	State	County	Protection agency	Administration unit
No.			*Acres*	*Acres*				
235.	Cottonwood—willow							
236.	Bur oak	Fort Niobrara	75	275	Neb.	Cherry	F.W.S.	Fort Niobrara N.W.R.
237.	Interior ponderosa pine	Fort Niobrara	200	275	Neb.	Cherry	F.W.S.	Fort Niobrara N.W.R.
		Narraguinnep	891	2,800	Colo.	Dolores	F.S.	San Juan N.W.R.
		Hurricane Canyon	101	520	Colo.	Teller	F.S.	Pike N.F.
		Upper Pine Creek	1,070	1,190	S. Dak.	Pennington	F.S.	Harney N.F.
		Meeks Table	38	68	Wash.	Yakima	F.S.	Snoqualmie N.F.
		Goodlow Mountain	1,081	1,260	Ore.	Lake	F.S.	Fremont N.F.
		Metolius	1,315	1,440	Ore.	Jefferson	F.S.	Deschutes N.F.
		Ochoco Divide	968	1,920	Ore.	Wheeler	F.S.	Ochoco N.F.
		Pringle Falls	195	1,160	Ore.	Deschutes	F.S.	Deschutes N.F.
		Santa Catalina	3,160	4,464	Ariz.	Pima	F.S.	Coronado N.F.
		Pole Bridge Canyon	320	320	Ariz.	Cochise	F.S.	Coronado N.F.
		Oak Creek Canyon	900	940	Ariz.	Coconino	F.S.	Coconino N.F.
		Monument Canyon	580	640	N. Mex.	Sandoval	F.S.	Santa Fe N.F.
		Butterfly Peak	420	1,000	Ariz.	Pima	F.S.	Coronado N.F.
		G. A. Pearson	154	154	Ariz.	Coconino	F.S.	Coconino N.F.
238.	Western juniper	Devil's Garden	1,600	1,600	Cal.	Modoc	F.S.	Modoc N.F.
		Goodlow Mountain	100	1,260	Ore.	Lake	F.S.	Fremont N.F.
239.	Pinyon—juniper	Sweetwater	2,012	2,235	Nev.	Mineral	F.S.	Toiyabe N.F.
		Narraguinnep	715	2,800	Colo.	Dolores	F.S.	San Juan N.F.
		Butterfly Peak	80	1,000	Ariz.	Pima	F.S.	Coronado N.F.
240.	Arizona cypress							
241.	Interior live oak							
242.	Mesquite							
243.	Ponderosa pine—sugar pine—fir	Pringle Falls	65	1,160	Ore.	Deschutes	F.S.	Deschutes N.F.
244.	Pacific ponderosa pine—Douglas fir							
245.	Pacific ponderosa pine	Persia M. Robinson	140	640	Ore.	Wasco	F.S.	Mt. Hood N.F.
246.	California black oak							
247.	Jeffrey pine	Indiana Summit	1,000	1,000	Cal.	Inyo	F.S.	Inyo N.F.
248.	Knobcone pine							
249.	Canyon live oak							
250.	Digger pine—oak	San Joaquin	50	50	Cal.	Madera	F.S.	San Joaquin Exp. R.

S.A.F. type No.	Name of forest cover type	Name of natural area	Area of type Acres	Total of natural area Acres	Location	Protection agency	Administration unit
			Alaskan types				
201.	White spruce	Skilak Lake	20	40	Skilak Lake	B.L.M.	Region VII B.L.M.
202.	White spruce—birch	Bedlam Lake	10	20	Bedlam Lake	B.L.M.	Region VII B.L.M.
204.	Black spruce	Tustumena Lake	20	30	Tustumena Lake	B.L.M.	Region VII B.L.M.
217.	Aspen	Sterling	20	30	Sterling	B.L.M.	Region VII B.L.M.
223.	Sitka spruce	Halibut Cove	20	30	Halibut Cove	B.L.M.	Region VII B.L.M.
		Limestone Inlet	392	6,439	Limestone Inlet	F.S.	Tongass N.F.
224.	Western hemlock	Limestone Inlet	703	6,439	Limestone Inlet	F.S.	Tongass N.F.
		Old Tom Creek	1,420	4,709	Old Tom Creek	F.S.	Tongass N.F.
		Pack Creek	872	5,800	Pack Creek	F.S.	Tongass N.F.
225.	Sitka spruce—western hemlock	Limestone Inlet	320	6,439	Limestone Inlet	F.S.	Tongass N.F.
		Old Tom Creek	346	4,709	Old Tom Creek	F.S.	Tongass N.F.
		Pack Creek	1,659	5,800	Pack Creek	F.S.	Tongass N.F.
		Totem Bight	879	879	Totem Bight	F.S.	Tongass N.F.
228.	Western redcedar	Old Tom Creek	920	4,709	Old Tom Creek	F.S.	Tongass N.F.
			Puerto Rican types				
301.	Tabonuco (Dacrydium excelsum) 43 spp.	Bano de Oro	920	1,840		F.S.	Caribbean N.F.
302.	Colorado (montane rain forest) 31 spp.	Bano de Oro	230	1,840		F.S.	Caribbean N.F.
303.	Palm brake 63 spp.	Bano de Oro	350	1,840		F.S.	Caribbean N.F.
304.	Elfin woodland 13 spp.	Bano de Oro	340	1,840		F.S.	Caribbean N.F.

B.L.M.—Bureau of Land Management
Exp. F.—Experimental Forest
Exp. R.—Experimental Range
F.W.S.—Fish and Wildlife Service
F.S.—Forest Service
H.U.—Harvard University
N.F.—National Forest
N.W.R.—National Wildlife Refuge
S.F.—State Forest
S.P.—State Park

Note: All areas in Alaska and Puerto Rico pending approval.

Membership Applications and Advancements

Proposals for admission, advancement, and reinstatement received in the Society office during the month of March are listed below.

Action on the eligibility of those proposed for membership as listed below will be taken by the Council as of June 1, 1954. Communications from voting members regarding the membership eligibility of these persons should be received in the Society office prior to that date.

Allegheny Section

Student Grade

PENNSYLVANIA STATE UNIVERSITY

Bimber, G. E. — Nicholls, C. S.
Cupka, L. J. — Post, P. W.
Harshbarger, L. L.

Junior Grade

Bergey, G. A., 507 W. College Avenue, State College, Pa.; Pa. State, B.S.F., 1954. (Student, 1953).

Gissy, J. A., 971 Willey St., Morgantown, W. Va.; W. Va. Univ., B.S.F., 1955. (Student, 1953).

Nicely, P. D., 721 Snider St., Morgantown, W. Va.; W. Va. Univ., B.S.F., 1954. (Student, 1953).

Stanley, W. C., 750 College Ave., Morgantown, W. Va.; W. Va. Univ., B.S.F., 1954. (Student, 1953).

Wawrynovic, F. J., Br. Mgr., Nittany Timberlands, Inc., Clearfield, Pa.; Pa. State, B.S.F., 1950.

Member Grade

Bjorkbom, J. C., Research Forester, N. E. Forest Expt. Sta., Upper Darby, Pa. (Junior, 1947).

Affiliate Grade

Clinton, I. W. A., Asst. Dist. Forester, State Dept. of Forests & Parks, Grantsville, Md.; Univ. of Toronto, B.S., (Forestry), 1951.

Appalachian Section

Student Grade

DUKE UNIVERSITY

Gross, D. F. — Stillwell, H. D.

NORTH CAROLINA STATE COLLEGE

Dallery, E. L.

Junior Grade

Carney, R. G., City Forester, N. C. Dept. Cons. & Dev., Salisbury, N. C.; Pa. State, B.S.F., 1950.

Lorio, P. L., Grad. Student, Duke Univ., Durham, N. C.; La. State, B.S.F., 1953.

Member Grade

Havel, J. F., Box 11, Pawley's Island, S. C. (Junior, 42R49).

Affiliate Grade

Lane, M. A., Inspector, A. T. & S. F. Ry. Co., Amarillo, Texas; Okla. A & M College, B.S., (Forestry), 1953.

Central Rocky Mountain Section

Junior Grade

Frederickson, P. W., 4525 Balsam St., Wheat Ridge, Colo.; Iowa State, B.S.F., 1952.

Central States Section

Student Grade

MICHIGAN STATE COLLEGE

Clutter, J. L. — Minkin, G. W.
Gould, R. J. — Voive, J. D.
Jessup, D. W. — Wedding, J. R.
Kutchere, G. E.

UNIVERSITY OF MICHIGAN

Creager, C. Q. — Hart, G. E.
Geertsema, G. L.

Junior Grade

Brevitz, R. F., Project Eng., Mich. Dept. of Cons., Battle Creek, Mich.; Mich. State, B.S.F., 1923.

Buck, B. B., 2360 Ellsworth Rd., Ypsilanti, Mich.; Univ. of Mich., B.S.F., 1954. (Student, 1953).

Eckert, E. C., Chief Forester, Mich. State Hwy. Dept., Lansing, Mich.; Mich. State, B.S.F., 1926. Reinstatement.

Leo, G. N., Box 213, Central Lake, Mich.; Univ. of Mich., B.S.F., 1954. (Student, 1954).

Affiliate Grade

Brain, I. H., 409 East St., Springfield, Ohio; Univ. of the South, B.S., (Forestry), 1951.

Columbia River Section

Student Grade

OREGON STATE COLLEGE

Barrows, D. B. — Tomlin, G. W.
Schaefer, W. F.

Junior Grade

De Bruin, H. W., Forester, U.S.F.S., Parkdale, Ore.; Univ. of Mich., B.S.F., 1948.

Fisher, A. K., Asst. Eng., Willamette Valley Lbr. Co., Dallas, Ore.; Iowa State, B.S.F., 1950.

Lyon, H. G., Reforestation Dir., State Forestry Dept., Salem, Ore.; Ore. State, B.S.F., 1948.

Meier, E. R., Forester, Bur. of Land Mgmt., Salem, Ore.; Univ. of Mich., B.S.F., 1949.

Melville, E. C., Salesman, Atlas Powder Co., Eugene, Ore.; Univ. of Wash., B.S.F., 1949.

Michel, K. R., Sales Trainee, Weyerhaeuser Sales Co., Oswego, Ore.; Univ. of Calif., B.S.F., 1947. Reinstatement.

Stoop, J. H., Forester, Mt. June Forest Prod. Co., Springfield, Ore. Reinstatement.

Thomas, F. S., Forest Eng., Tygh Valley Lbr. Co., Tygh Valley, Ore.; Univ. Wash., B.S.F., 1948.

Affiliate Grade

Bolz, R. A., Asst. Accountant, Union Pacific Railroad Co., Portland, Ore.; State College of Wash., B.S., (Forestry), 1950.

Henderson, H. T., Inspector, Weyerhaeuser Tbr. Co., Coos Bay, Ore.

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Darsey, F. E., Field Asst., International Paper Co., Jena, La.; L.P.I., B.S., (Forestry), 1950. (Affiliate, 1951).

Parks, J. G., Forester, Kirby Lbr. Corp., Cleveland,Texas; Univ. of Mich., B.S.F., 1953.

Puckett, J. W., Forester, Colfax Lbr. & Creosoting Co., Pineville, La.; La. State, B.S.F., 1950.

Willard E. H., 14 Perrin Drive, Waco, Texas; W. Va. Univ., B.S.F., 1949.

Affiliate Grade

Bell, R. E., Forest Tech., Gaylord Container Corp., Bogalusa, La.; Okla. A & M, B.S., (Forestry), 1953.

Eagles, H. C., Dist. Forester, International Paper Co., Alexandria, La.; La. State, B.S. (Industrial Ed.), 1942.

Lowe, C. D., Asst. Dist. Forester, Miss. Forestry Comm., Philadelphia, Miss.; Miss. State, B.S., (Agric.), 1941.

Mullavey, R.E., Forester, U.S.F.S., Alexandria, La.; Univ. of N. H., B.S., (Forestry), 1948.

Peevy, F. A., Rge. Conservationist, U.S.F.S., Alexandria, La.; La. State, B.S., (Agronomy), 1941.

Rogers, B. F., Forester, Texas Forest Farms, Inc., Cleveland, Texas; Stephen F. Austin State College, B.S., (Forestry), 1951.

Routh, D. C., Forest Tech., Gaylord Container Corp., Bogalusa, La.; Okla. A & M, B.S., (Forestry), 1953.

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Hanover, J. W., Sales Eng., W. Coast Wood Preserving Co., Seattle, Wash.; Univ. of Wash., B.S.F., 1953.

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Simmonds, P. H., Area Leader, U.S.F.S., Jefferson, Maine; Pa. State, B.S.F., 1925.

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Affiliate Grade

Potkovick, W., Cons. Aide, U.S.D.A., Owego, N. Y.; N. Y. State Ranger School, 1950.

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Sauer, A. W., Forester, Bur. of Land Mgmt., San Mateo, Calif.; Oregon State, B.S.F., 1941.

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Cook, R. A., Forester, Lolo Ranger Sta., Lolo, Mont.; Colo. A & M, B.S.F., 1950.

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Moon, G. C., State Forester, State of Mont., Missoula, Mont.; Mont. State, B.S.F., 1949.

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Walker, G. S., Forester, U.S.F.S., Bozeman, Mont., Univ. of Idaho, B.S. (Forestry), 1953.

Ozark Section

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Taylor, V. E., Dist. Ranger, U.S.F.S., Mena, Ark.; Univ. of Wash., B.S.F., 1932. Reinstatement.

Member Grade

Hopson, M. C., Ranger, U.S.F.S., Jasper, Ark. (Junior, 1947).

Meeks, D. M., Forester, Box 612, Harrison, Ark. (Junior, 1947).

Affiliate Grade

Freeman, J. C., Farm Forester, Okla. Div. of Forestry, Mangum, Okla.; Okla. A & M, B.S., (Forestry), 1951.

Hale, D. A., Route 5, Camden, Ark.; Ark. A & M, B.S., (Forestry), 1951.

Hoffmann, C. R., Forest Technician, International Paper Co., Arkadelphia, Ark.; Ark. A & M, B.S., (Forestry), 1951.

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Jensen, J. C., Asst. Dist. Forester, U. S. Dept. Interior, Fairbanks, Alaska; Iowa State, B.S.F., 1949.

Kooser, D. L., Log Buyer, Buffelin Mfg. Co., Tacoma, Wash.; Univ. of Wash., B.S.F., 1948.

Mason, A. L., Forester, U.S.F.S., Enumclaw, Wash.; Univ. of Wash., B.S.F., 1951

Powers, F. J., Salesman, Seattle Retail Lbr. Co., Seattle, Wash.; Univ. of Wash., B.S.F., 1951.

Scarlett, J. G., Asst. Logging Eng., Rayonier, Inc., Sappho, Wash.; Univ. of Wash., B.S.F., 1939.

Member Grade

Krayer, W. J., Forestry Aide, U.S.F.S., Glacier, Wash.; Purdue Univ., B.S.F., 1950. (Junior, 1950).

Skinner, C. K., Asst. Supt., Mt. Rainier Natl. Park, Longmire, Wash.; Univ. of Colo., B.S. (Journalism), 1928. (Aff. 1936, Junior, 1950).

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Clark, R. T., Forester, St. Marys Kraft Corp., St. Marys, Ga.; Univ. of Fla., B.S.F., 1951.

Coleman, W. J., Flavet III, Gainesville, Fla.; Univ. of Fla., B.S.F., 1954. (Student, 1953).

Hays, B. S., Forester, 424 N. Grandview Ave., Daytona Beach, Fla.; N. C. State, B.S.F., 1940. Reinstatement.

House, G. O., Farm Forester, Fla. Forest Service, Blountstown, Fla.; Univ. of Ga., B.S.F., 1949.

Johnson, R. A., Forestry Aide, Corps of Engineers, U.S.A., Decatur, Ga.; Univ. of Ga., B.S.F., 1949.

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Gibson, L. P., Tbr. Land Mgr., Canal Timber Corp., Perry, Fla.; Fla. State Univ., B.S., (Geography), 1953.

Associate Grade

Belcher, S. E., President, S. E. Belcher, Inc., Greenpond, Ala.

Hale, E. E., Exec. Vice-President, Ala. Forest Products Asso., Montgomery, Ala.; A.P.I., B.S., (Agriculture), 1925.

Southwestern Section

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Member Grade

Jones, M. F., Dist. Forest Rgr., U.S.F.S., Clarkdale, Ariz.; Utah State Agric., B.S.F., 1936, (Junior, 1950).

Affiliate Grade

Bendt, R. H., Park Rgr., Natl. Park Service, Grand Canyon, Ariz.; Oregon State, B.S., (Wildlife Mgmt.), 1951.

Southern California Section

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Muerle, G. F., 846 West 80th St., Los Angeles, Calif.; Univ. of Calif., B.S.F., 1951.

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Chance, R. L., 822 West 5th St., Boone, Iowa; Iowa State, B.S.F., 1954, (Student, 1953).

Gatherum, G. E., Asst. Prof., Dept. of Forestry, Iowa State College, Ames, Iowa; Univ. of Wash., B.S.F., 1949; Utah State Agric., M.S., 1951.

Hall, J. F., Nursery Supt., State of Minn., Willow River, Minn.; Univ. of Minn., B.S.F., 1949.

Russell, R. J., 2711 Lincoln Way, Ames, Iowa; Iowa State, B.S.F., 1954, (Student, 1952).

Ystesund, K. A., 2169-F Hoyt Ave., St. Paul, Minn.; Univ. of Minn., B.S.F., 1954, (Student, 1953).

Member Grade

Emerson, W. J., Fire Dispatcher, U.S.F.S., Ely, Minn. (Junior, 1947).

Granum, B. M., Forester, State of Minn., Benidji, Minn. (Junior, 1946).

Hultengren, R. D., Forester, Iron Range Res. Comm., Grand Rapids, Minn. (Junior, 1947).

Long, J. C., N. W. Paper Co., Cloquet, Minn. (Junior, 1947).

Rogosheske, G. L., Forester, State Forest Service, Littlefork, Minn. (Junior, 1947).

Sandberg, L. W., Lake Superior Tbr. Co., Duluth, Minn. (Junior, 1947).

Wilson, D., Hill City, Minn. (Junior, 1947).

Wisconsin-Upper Michigan Section

Junior Grade

Cavalieri, A., 506 6th St., Iron Mountain, Mich.; Mich. State, B.S.F., 1954, (Student, 1953).

Affiliate Grade

Graves, H. J., Dist. Forester, Wm. Bonifas Lbr. Co., Marenisco, Mich.; Mi h. College of Mining & Tech., B.S., (Forestry), 1947.

Forestry News

Albert Arnst Appointed Managing Editor the Lumberman

Appointment of Albert Arnst as managing editor of *The Lumberman* was announced in March by W. E. Crosby, editor of *The Lumberman* and a director of Miller Freeman Publications.

The new managing editor will be located in *The Lumberman's* Portland, Ore., office and from this center of the western forest industries, will direct the journal's editorial field staff stretched from New Orleans to Vancouver, B. C. W. E. Crosby will continue as editor, located in Seattle, and the journal will be published there as it has been for 56 years.

Arnst is a 1931 graduate of Oregon State College's School of Forestry. He first served six years with the Forest Service in Oregon and Washington in various phases of forest protection work in the Portland regional office, as well as ranger district assignments. This was followed by eight years with the S.C.S., in charge of farm forestry activities in various parts of Oregon and Washington. He also served briefly with Skagit Steel & Iron Works, and as associate editor of *The Timberman*, before joining Weyerhaeuser Timber Company in 1946, with whom he was affiliated for six years. His assignments included primarily public relations activities and writing.

In 1952, Arnst became editor of *The Timberman*, resigning that position in 1953 to join the Western For-

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STATE FORESTER C. H. COULTER of Florida *(right)* is shown as he received a Woodmen of the World conservation award in recognition of his work in the conservation of natural resources. The presentation was made by Florida's Attorney General Richard Ervin, a member of Woodmen of the World National Service Committee.

estry and Conservation Association in Portland, where he has done special assignment writing and also publicity work for that association's recent annual conference.

Currently, Arnst is chairman of the Portland Chapter of the S.A.F. He is also chairman of the weekly meeting of the Columbia River Section of the Pacific Northwest Logger's Association, and immediate past chairman of the Division of Public Relations of the S.A.F. Other professional affiliations include the American Forestry Association, Soil Conservation Society of America and the Portland Lion's Club. He is a member of Xi Sigma Pi, honorary forestry fraternity, and of Phi Kappa Pi, all-school honorary society, and he has been a contributor of popular articles on forestry subjects.

C. H. Coulter Honored by Woodmen of the World

State Forester C. H. Coulter of Florida recently received recognition from the Woodmen of the World for "outstanding contribution in the field of conservation."

He was presented an inscribed metallic plaque by Florida's Attorney General Richard W. Ervin, a member of the Woodmen of the World National Service Committee, depicting each phase; minerals, soil, water, wildlife and forests. Ervin outlined the background of the award as part of the Woodmen of the World "fraternity in action" program which was inaugurated in 1946. Mr. Coulter was introduced to Florida's forest problems in 1928 and has served the department in various capacities continuously since 1929. He has been state forester since 1945.

Florida's forest acreage under organized fire control has increased during his tenure from approximately 5,500,000 to nearly 14,000,000 with 30 new counties added. Pine seedlings planted increased from less than 3,000,000 to approximately 50,000,000. Mr. Coulter last year was elected vice president of the Association of State Foresters and to membership on the Council of the Society of American Foresters.

In response, Mr. Coulter expressed appreciation to the more than 600 Forest Service employees and others who cooperated with the overall forestry program.

The state forester presented the 50 millionth pine seedling grown in the state nurseries to Dr. A. B. Kennedy for planting at the San Antonio, Texas, Woodmen of the World Memorial Hospital.

Coulter was one of the more than 100 persons throughout the United States to receive the award, but only the second forester so honored.

Record 715,000 Acres Planted in 1953

Forest tree planting last year was a record 715,548 acres, the U. S. Department of Agriculture reports. The Forest Service reported forest and shelterbelt planting by public agencies, forest industries and individual landowners in the year ending June

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30, 1953, was 193,000 acres (37 percent) more than was planted in the year ending June 30, 1952, which was the previous record year.

Of the total acres planted 77,612 were on federally administered lands, 63,791 on lands administered by the states or other non-federal public agencies and 574,145 on privately owned lands.

Fourth World Forestry Congress

According to the latest announcement from India, the Fourth World Forestry Congress will be held at Dehra Dun from December 11 to 22, 1954, five days later than stated in the April issue of the JOURNAL OF FORESTRY. The inaugural session will take place in December 11, and delegates are requested to reach Dehra Dun not later than December 10. The Congress will be preceded by excursion tours through India, "details of which," the announcement says, "will be supplied in due course."

Fees for regular members will be Rupees 175 (about $36), and for associate members Rupees 75 (about $15), payable before the beginning of the Congress to the Congress Secretariat. Payment of the membership fee will entitle members to participate in all the official activities except excursions, for which an extra fee will be charged.

The program as announced in the April issue of the JOURNAL remains substantially unchanged.

The Government of India invites to this Congress "all governments, forest services, forest and forest products research institutes, forestry schools, forest and forest industry organizations, and all individual foresters and technicians of forest industries, students and friends of forestry who are willing to attend the Congress in a personal capacity."

A U. S. Organizing Committee is now being formed in Washington to receive applications for membership and to supply information regarding passports, visas, vaccination requirements. All Society members interested in attending the Congress are requested to notify as soon as possible Tom Gill, Chairman, Committee on International Relations, 1214 16th Street, N. W., Washington 6, D. C.

Resource Use Effects in American Tropics to be Studied

A 3-year study of land and resource use in the American tropics will be undertaken by the Instituto Mexicano de Recursos Naturales Renovables, A.C., in cooperation with the Charles Lathrop Pack Forestry Foundation, of Washington, D. C., USA. The study will be under the direction of the Director of the Instituto, Professor Enrique Beltran, eminent conservationist, who was awarded the first Pan American Conservation Award, given in 1949.

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The purpose of the study is to determine the effect of generations of human use on the natural resources, with the hope of learning what patterns of use may lead to better methods of soil and resource conservation. The Peninsula of Yucatan, in Mexico, has been selected as the site for the study, which will be conducted by teams of Mexican and North American experts chosen from many disciplines, in order to secure an integrated viewpoint. So far as is known, this is the first study of its kind ever made in the American tropics, and the proper techniques to be worked out will in themselves constitute a research project. The Instituto and the Foundation officials hope that both in methods and results the study may serve as a guide for future population-resource projects in the tropics.

Half of Maryland is Commercial Forest

Nearly half of Maryland's land area is covered with commercial forests which contain about 6½ billion board feet of sawtimber, according to a survey made by the Northeastern Forest Experiment Station of the Forest Service in the U. S. Department of Agriculture.

This survey is the first intensive inventory ever made of Maryland forests. Collaborating with the Forest Service in this survey were: the Maryland Departments of State Forests and Parks, Research and Education, and Game and Inland Fisheries.

The survey indicates that oak species account for 2.3 billion board feet of Maryland's timber. Other hardwoods account for 2.7 billion board feet. Loblolly pine accounts for 1.1 billion board feet, and other softwoods for the remaining ½ billion board feet.

The survey also shows that only 16 percent of the commercial forest land has stands of sawtimber, averaging more than 5,000 board feet per acre. Lighter stands of sawtimber, 1,500 to 5,000 board feet per acre, occupy 31 percent of the forest land. The remaining 53 percent of the forest land has little or no sawtimber on it.

With the completion of the survey, the Northeastern Forest Experiment Station published a pamphlet on forest statistics for the Eastern Shore of Maryland. Reports on the western and central sections were published previously. A copy of the latest booklet may be obtained by writing to the Northeastern Forest Experiment Station, 102 Motors Ave., Upper Darby, Penn.

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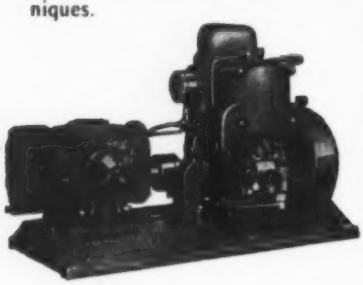

Above: Model "Y" . . . medium weight (70 lbs.) for portability with power . . . 63 g.p.m. at 100 p.s.i. to 20 g.p.m. at 225 p.s.i.
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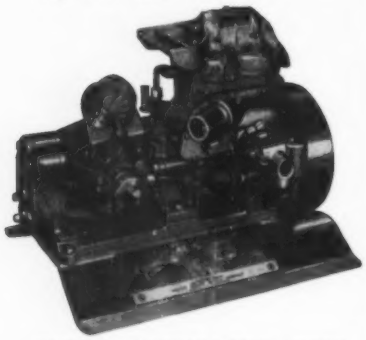

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Government

Ernest Swift Becomes Assistant Chief Fish and Wildlife Service

Ernest Swift, director of Wisconsin's Conservation Department has been named assistant chief of the U. S. Fish and Wildlife Service, Department of Interior.

Mr. Swift has been with the State of Wisconsin since 1925 and during the past 7 years has served as director of the Conservation Department. His resignation to assume his new position was announced as effective March 15.

W. G. Guernsey B.L.M. Assistant Director

Secretary of the Interior Douglas McKay announced in March two major personnel shifts as part of the administrative reorganization of the Bureau of Land Management recently recommended by a survey team.

William G. Guernsey, regional administrator in Portland, Ore., was transferred to Washington, D. C., as an assistant director of the Bureau of Land Management.

Earl J. Thomas of Sacramento, Calif., was transferred from the Bureau of Reclamation, to serve as assistant to the director of B.L.M. His immediate assignment will be to coordinate reorganization activities.

Pacific N. W. Experiment Station Advisory Group Formed

The first meeting of the newly formed Pacific Northwest Forest and Range Experiment Station advisory committee was held in Portland, Ore., in February. Its function will be to discuss with the station from time to time the various phases of the latter's program, with the purpose of offering suggestions and recommendations.

E. F. Heacox, Weyerhaeuser Timber Co., is chairman of the committee; C. W. Richen, Crown Zellerbach Corp., vice chairman; and R. W. Cowlin, director of the station, will serve as secretary.

Other foresters included in the committee are Donald E. Colwell, Cascade Lumber Co.; George L. Drake, Simpson Logging Co.; Dean Paul M. Dunn, Oregon State College; W. D. Hagenstein, Industrial Forestry Assn.; Ernest L. Kolbe, Western Pine Assn.; Elmer Lofgren, Neils Lumber Co.; Dean Gordon Marckworth, University of Washington; David T. Mason, Mason, Bruce and Girard; Stuart Moir, Western Forestry and Conservation Assn.; O. Harry Schrader, Jr., U. S. Plywood Corp.; George Sparr, Oregon State Board of Forestry; J. Herbert Stone, regional forester; R. T. Titus, Western Forest Industries Assn.; and L. T. Webster, Washington Division of Forestry.

Final Plans Announced for Timber Resource Review

Final draft of the nationwide Timber Resource Review has been announced by the U. S. Forest Service. This will be the first complete timber survey undertaken since 1945 and is intended to provide a fresh analysis of the timber resource situation. The Review is expected to be completed in the first half of 1955 and will be submitted in two parts: a statistical report and interpretative report.

The Forest Service in 1952 proposed the TRR project because of the great changes in the postwar domestic and foreign situation. It was felt that a new analysis of the timber resource situation was desirable.

Among the phases to be reviewed are: current consumption and potential requirements for timber products, timber utilization, growth goals and trends, status of protection, extent and significance of changes in forest land ownership, contributions of national forests to local government, taxation and credit problems as related to forest management, and a narrative report on the forestry situation in interior Alaska.

Forest Service Announces Northwest Personnel Changes

John R. Bruckart, Eugene, Ore., plans to retire June 30 after completing 45 years of public service in the Pacific Northwest. Bruckart has been supervisor of the Willamette National Forest since 1938.

He will be succeeded on the Willamette by Robert Aufderheide, who since 1950 has been supervisor of the Umpqua forest at Roseburg, Ore.

Moving to the Umpqua forest will be Vondis E. Miller who has been supervisor of the Ochoco since 1952.

New supervisor of the Ochoco will be Cleon Clark, who has been in charge of the Malheur Forest at John Day, Ore., since 1943.

J. Malcolm Loring, supervisor of the Chelan forest at Okanogan, Wash., since 1946 will succeed Clark on the Malheur.

Succeeding Loring on the Chelan

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will be Chester A. Bennett, now in charge of the Wallowa forest at Enterprise, Ore.

Supervisor H. S. Coons, in charge of the Whitman forest at Baker, Ore., since early 1951, has been named to head the consolidated Wallowa-Whitman forest.

Interior Reports on 1953 Forest Fires

During 1953, according to their Information Service, the Department of the Interior's agencies reported 2,717 fires, a slight increase of the average for the past ten years. Man-caused fires, however, have continued to decrease from 1,678 in 1952 to 1,472 in 1953.

The National Park Service experienced difficult situations at Yosemite, Yellowstone, and Everglades National Parks because of the largest number of lightning caused fires in its history.

The Fish and Wildlife Service reported only 92 fires and 5,643 acres burned, making 1953 its best year.

The Bureau of Indian Affairs, although reporting more fires than its average for the previous ten years, was able to confine fires to 38,827 acres, the lowest in the past ten years except for 1950.

Although the Bureau of Land Management showed an acreage loss considerably lower than its ten year average, at one time last summer in Alaska it was unable to place fire fighters on all going fires which accounts to a great degree for the loss of nearly 500,000 acres there. The Bureau, although having made considerable progress in fire control, cannot be said to have adequate protection in all areas, particularly in Alaska.

F. J. Shulley Directs Korean Extension School

An agriculture school for more than 1,500 Korean farmers was opened February 15 at Ching Ryang Ri, eight miles east of Seoul, where the Korea Civil Assistance Command (KCAC) has an Agricultural Extension Station. The school will be on the order of U. S. agricultural extension schools and under the direction of Mr. Fred J. Shulley who is a veteran of agricultural and forestry school work in both the U. S. and Japan.

"Classes of about 250 students will attend a series of six 9 day sessions of the school," Mr. Shulley announced. Thus, a total of more than 1,500 Korean farmers will be taught up-to-date farming methods with practical demonstrations under actual farming conditions as found in Korea. Some of the demonstrations will be tree spraying in an orchard, fruit tree grafting, farm irrigation methods, disease innoculations against cattle and farm animal disease, and fertilizing methods including instruction in method, quantity and schedules of application.

Mr. Shulley has been in Korea continually since June, 1951. A graduate of Pennsylvania State College in forestry ('22) and Yale University School of Forestry ('24), he was extension forester for the University of Arkansas prior to WW II. During WW II he served on the War Production Board in the States, and from 1947 to 1951 was assigned to the Natural Resources Division, GHQ U. S. Army in Japan.

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Private & Industrial

Gaylord Container Corp. Plants One Hundred Millionth Seedling

The site of a sawmill ghost town at Millard, Miss., was the setting for a ceremony that marked planting of the one hundred millionth pine seedling on the lands of the Gaylord Container Corporation.

Shown in the accompanying photograph, taking part in the ceremony are:

A. C. Goodyear, New York, chair-

GAYLORD Container Corporation plants one hundred millionth tree on company land. *See accompanying story.*

man, Board of Directors of the corporation and former president of the Great Southern Lumber Co.; J. K. Johnson, Bogalusa, La., former chief forester, Great Southern; Mary Easton Goodyear, Buffalo, N. Y., granddaughter of C. W. Goodyear; and C. W. Goodyear, first vice president of Gaylord Container and former vice president of Great Southern.

This planting program had its inception in 1920 when the Great Southern Lumber Co. of Bogalusa decided to reforest, by artificial means, thousands of acres of cut-over land in that vicinity. Following a merger in 1937 between Great Southern and Gaylord interests, the project was continued by Gaylord Container.

The total area of Gaylord's man-made forests in Louisiana and Mississippi is now 110,500 acres. This is believed to be the largest privately owned planted forest on the continent.

David T. Mason Receives Conservation Award

One S.A.F. member was among recipients of the Department of the Interior's Conservation Award announced in March by Secretary Douglas McKay.

David T. Mason, Consulting Forester, of Portland, Ore., was commended for his interest in sustained-yield forest management and for his efforts to secure public acceptance for this conservation principle.

American Pulpwood Officers Elected

The American Pulpwood Association elected the following officers for 1954 at their Members Meeting in February:

President—L. J. Freedman, Penobscot Chemical Fibre Co., Great Works, Maine.

Vice presidents—G. B. Amidon, Minnesota & Ontario Paper Co., International Falls, Minn., and W. J. Damtoft, Champion Paper & Fibre Co., Canton, North Carolina.

Executive secretary-treasurer—W. S. Bromley, 220 East 42nd Street, New York 17, New York.

Forest Industries Council Announces 1954 Officers

The Forest Industries Council, policy coordinating organization of the lumber, paper, pulp and pulpwood industries, has re-elected as its chairman for 1954, Charles H. Sage, vice president of the Kimberly-Clark Corp., Neenah, Wisc.

Also re-elected for another year were Truman Collins of the Collins Pine Co., Portland, Ore., as deputy chairman, and A. Z. Nelson of the National Lumber Manufacturers Association as secretary.

Members of the F.I.C.'s Executive

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These instruments are *rugged* . . . designed to stand up without the need of constant adjusting even under the rough usage of forest work.

THE RIGHT ANGLE PRISM

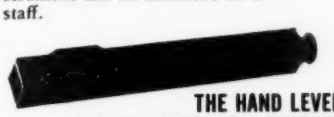
This compact instrument consists of a single ground triangular prism and it, therefore, cannot get out of adjustment. A plumb bob can be attached to the hook of the handle.

THE RIGHT ANGLE MIRROR

This instrument gives a slightly larger field of view and is adjustable. As an added feature, a small plumb bob is conveniently stowed in the handle.

THE DOUBLE RIGHT ANGLE PRISM

Consisting of two ground pentaprisms separated by a plano-parallel element, it can be *placed on a line between two points* and a third point at right angles can be sighted. A plumb bob can be attached or the instrument can be mounted on a staff.



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SAN LORENZO, CALIFORNIA

Committee also will continue in office for another year. They are Leo V. Bodine, executive vice president of the National Lumber Manufacturers Association; Earl W. Tinker, executive secretary of the American Paper and Pulp Association, and W. S. Bromley, executive secretary of the American Pulpwood Association. Bodine is chairman of the Executive Committee.

The election of officers took place during the F.I.C.'s annual meeting Feb. 19 at the Waldorf-Astoria Hotel, New York.

Tremont Lumber Company Adds Two Foresters and Radio System

Tremont Lumber Company of Joyce, La., has recently expanded and improved its Forestry Department with the addition of two new foresters and the installation of a radio communications system, according to H. P. Greer, general manager of the company.

The new foresters on the staff are Earl M. Braden, Jr. (B.S.F., L.S.U. 1948) and Edgar C. Wilkins (B.S.F., L.S.U. 1952). Mr. Braden is a native of Tennessee and previously was with the Tennessee Division of Forestry. Mr. Wilkins is a native of Louisiana and formerly employed by the Mississippi Forestry Commission. The company now has a total of six foresters in its Forest and Land Department, with H. V. Dunford (B.S.F. Michigan State 1915), manager of the Forest and Land Department, and Joe D. Burns (B.S.F., L.S.U. 1947, M.F., L.S.U. 1948) chief forester.

Mr. Greer states that the two-way radio system which commenced operating October 1953 has greatly facilitated woods operations and fire control. The installation consists of a 250 watt base station located in the main office at Joyce, nine mobile units and one portable set. In addition to the company system, they have three units operating on the Louisiana Forestry Commission frequency for coordinated fire control purposes.

Research Foundation Aids Study of Pine Seed

A grant from the Forest Genetics Research Foundation of $3,000 has been made to the Committee on Southern Forest Tree Improvement for a study of geographic races of four species of pines. The grant will be administered by the Southern Forest Experiment Station. It will be used to keep office work on the study abreast of field work by cooperators in sixteen states.

The Forest Genetics Research Foundation is a non-profit corporation set up to support selected forest genetics research projects throughout the United States. Its Board of Directors consists of industrialists, geneticists, and foresters from all timber producing regions in the country.

The Committee on Southern Forest Tree Improvement, recipient of the Foundations' grant, was organized in 1951 to stimulate and guide genetic improvement of southern forests. Its membership is drawn from private, state, federal, and educational forestry agencies. Its present chairman is Dr. C. M. Kaufman, Director of the School of Forestry, University of Florida.

Weyerhaeuser Sponsors Two Fellowships at Oregon State

Two graduate research fellowships in forest management will be sponsored at Oregon State college during the next two years by Weyerhaeuser Timber foundation.

A $1,000 fellowship has been offered by the foundation for the past five years, according to Paul M. Dunn, O.S.C. dean of forestry. In 1954-55 and 1955-56, the foundation will give $2,000 per year for two graduate study grants.

Recipients will be selected by a committee of forestry school staff members.

Previous winners of the Weyerhaeuser fellowships include Robert H. Ruth, now with Cascade Head forest

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experiment station, Otis; Arthur Holmes, Columbia-Hudson Lumber Company, Portland; Nichols V. Mason, British Columbia Forest Service, Victoria, B. C.; Robert W. Mounteer, who next month will join the staff of the Oregon state board of forestry; and David F. Keiser, this year's recipient who is completing graduate studies.

G. R. White to Head A.F.P.I. Chicago Office

George R. White, of Franklin Park, Ill., is the newly appointed field manager for American Forest Products Industries for Illinois, Nebraska and Iowa. Mr. White's headquarters is in Chicago where his office is located at 59 East Van Buren Street, Room 715.

As A.F.P.I. manager in the three-state area, White will have charge of the forest industry organization's "Tree Farm" program and the "Keep America Green" forest fire prevention campaign. He will work closely with forest industries in the three states.

White is a forestry graduate of Oklahoma A & M College.

The Chicago office of A.F.P.I. had been temporarily closed since the resignation last autumn of Nort Baser, now a member of the editorial staff of *Wood and Wood Products Magazine*.

P. N. Joranson at Institute of Paper Chemistry

Philip N. Joranson has moved permanently from Beloit College, Beloit, Wisc., to the Institute of Paper Chemistry, Appleton. He will be responsible at the institute for a new program that will include fundamental and practical aspects of the genetic improvement of forest trees in the U. S. for the production of pulpwood. At first, his work will consist largely of a continuation and intensification of the polyploid aspen program on which he has worked for the past two years with the support of the Rhinelander Paper Co. and the Marathon Corp.

Millions See "Bounty of the Forest"

"The Bounty of the Forest," only three-quarters of the way through its first year of distribution, has already been screened before more than 15 million persons, the Western Pine Association has announced.

The movie, a full-color documentary covering the story of lumber from its growth through its end uses, was released to the public by the association last April. At present 103 prints, including 20 in black and white for television screening, are in continuous circulation.

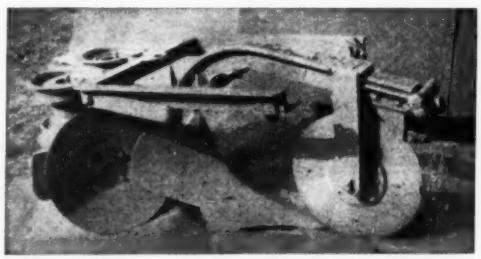
During the first nine months of showing, the association reported, the movie was shown about 1,500 times before live and television audiences.

The film is available for loan to responsible individuals for showings before retail and wholesale lumber groups, sales meetings, school, civic, service, church and other such gatherings. Prints may be obtained by writing Western Pine Association, Yeon Building, Portland 4, Oregon.

N.L.M.A. Public Relations Program Wins Award

National recognition for outstanding public relations achievement has been given the public relations program of the National Lumber Manufacturers Association.

The American Public Relations As-



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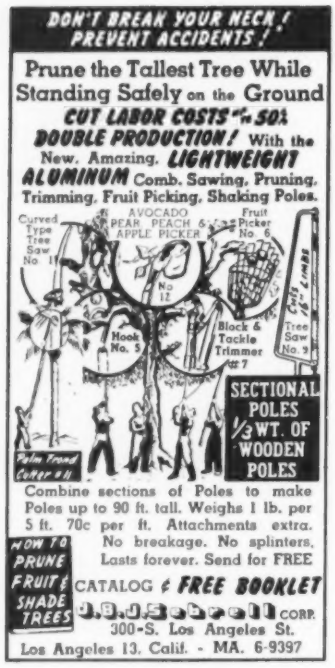
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THE SITKA SPRUCE of the Pacific Coast, the largest of the spruce family, has been naturalized in Scotland, and helps to shelter the flat shorelines of the Zuider Zee in Holland.

sociation has awarded the N.L.M.A. a Certificate of Outstanding Achievement for its 1953 public relations program.

Douglas S. Steinberg, Director of Public Relations of the National Lumber Manufacturers Association, accepted the award for the association at a special luncheon April 6, at the Biltmore Hotel, New York.

The honor was achieved in national competition with the public relations programs of more than 40 other associations. Fourteen other classifications were similarly judged.

Education

C. W. Ralston Joins Duke Forestry Faculty

Dr. Charles W. Ralston has joined the Duke University School of Forestry faculty as assistant professor of soils according to an announcement by Dean C. F. Korstian.

Dr. Ralston received the B.S. degree in forestry from Colorado A.M. College in 1942 and the M.F. and Ph.D. degrees from Duke in 1947 and 1949, respectively, majoring in forest soils.

During his last year in Duke he held a fellowship and was elected to Sigma Xi, honorary scientific society. He is also a member of Phi Kappa Pi, Xi Sigma Pi, and Phi Sigma honorary fraternities.

CHARLES W. RALSTON

Prior to returning to Duke, Ralston was a member of the faculty of the School of Forestry, University of Florida. In addition to teaching experience he has published several papers based on original research.

Dr. Ralston succeeds Dr. T. S. Coile who resigned Jan. 31.

Southern Illinois U.—U. of Michigan Cooperative Study Program Announced

A cooperative program of study leading to a Bachelor of Science in Forestry degree has been worked out between Southern Illinois University, Carbondale, and the University of Michigan, Ann Arbor, it has been announced by the former school.

Under the cooperative plan, a student interested in a professional forestry degree may take a two-year preforestry course of study at S.I.U. and then transfer to the University of Michigan Department of Forestry without loss of time or credit. There are no four-year professional schools of forestry in Illinois.

Allied

A.F.A. Conservation Awards Nominations Open

Nominations now are being accepted by The American Forestry Association for its seventh annual conservation awards to individuals who have contributed outstanding service in the

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field of conservation, Lowell Besley, executive director-forester of A.F.A., has announced.

Eligibility for nomination is not limited to persons actually working in the field of renewable natural resources. The awards, the first to be presented by a national organization to private citizens, are intended to recognize and reward individuals whose contributions to conservation have been beyond the demands of their regular means of livelihood. Five winners will be selected from as many categories, and nominees will be categorized on the basis of their primary employment rather than on the phase of conservation in which they have been active. The categories, he said, are public servants, business and industry, education, public information, and a classification that includes persons not embraced by the other four categories.

Presentation of the awards will be made at A.F.A.'s annual meeting September 6-9 in Portland, Ore. Nomination blanks may be obtained by writing to The American Forestry Association, 919 17th Street, N.W. Washington 6, D. C.

Besley also announced that U. S. Representative Watkins M. Abbitt of Appomattox, Virginia, and Charles Collingwood, well-known CBS radio and television newscaster of New York City have been re-elected to three-year terms on the awards committee by the Association's Board of Directors. Robert N. Hoskins, Norfolk, Virginia, industrial forester for the Seaboard Air Line Railroad Company, was again named chairman of the committee. Other committee members are Milton M. Bryan, Arlington, Virginia, chief of the woodland management section, U. S. Forest Service; Dr. Paul D. Sanders, Richmond, Virginia, editor of *The Southern Planter;* and Dr. M. D. Mobley, Washington, D. C., director of the American Vocational Association.

Awards Information to be Published

The publishers of *Who's Who in America* have begun gathering material for a comprehensive volume covering awards of national reference interest made during the year in the United States. One of the major classifications is awards in the field of forestry.

All donors of awards, prizes, and fellowships and scholarships of national importance relating to this field are invited to send full particulars to the publishers for consideration and possible inclusion. Address *The Blue Book of Awards.* The A. N. Marquis Company, Marquis Publications Building, Chicago 11, Illinois.

Products & Equipment

Tests for Relief of Poison Oak

Poison oak is one of the big problems of the California State Division of Forestry. Every year it takes men "off the job" who are needed in fire-control work. Starting in June 1952 and continuing through October exhaustive tests made in hospitals and work camps, under state doctor supervision in cooperation with the California State Division Forestry, showed the preparation "So Help Me Hannah" outstanding over other known products for its ability to give relief and to clear up poison oak dermatitis. In practically all cases the men treated stated that the ointment also checked weeping and reduced swelling, even in "smoke" cases where men were fighting fires. "So Help Me Hannah" is available from any druggist.

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New Pruning Tool

A new tool, the #12 Trimmer and Saw Combination, has been added to the line of tree pruning and trimming equipment manufactured by J. B. Sebrell Corporation of Los Angeles, Calif. No longer is it necessary to own both a trimmer and a saw, since this tool will fill both needs.

The #12 Trimmer and Saw Combination prunes limbs up to 1½ inches in diameter and saws limbs up to 18 inches in diameter while standing safely on the ground. The saw blade is made of extra heavy duty steel that fits into a serrated socket permitting 13 different saw positions with a simple adjustment.

The new combination trimmer and saw can be attached to any length lightweight aluminum pole. Poles are sectional, coming in 3-, 4-, 5-, or 6-foot sections. By combining these sections, inserting the end of one section into the expanded end of another, the operator has a pole to match the height of any tree. The trimmer, or pruner, easily cuts limbs up to 1½ inches in diameter with a slight pull on the operating rope.

In addition to the #12 Trimmer and Saw Combination, a dozen different saws, trimmers, hooks, knives, etc. can be used on one pole instead of having to buy and transport a number of poles. The poles weigh less than one pound per yard; a 30-foot pole weighs less than 7 pounds. For further information or prices on items, contact J. B. Sebrell Corporation, 300 S. Los Angeles St., Los Angeles 13, Calif.

New Two-Man Chain Saw

McCulloch Motors Corporation, Los Angeles, has announced a new two-man chain saw, the Model 99. A new high-horsepower motor design is said to save one hour out of ten in production logging and a new fuel tank has increased capacity, permitting an additional 30 minutes of operation before refueling. Changes include new type connecting rod bearing with four times longer life, new alloy steel, heavy-duty clutch rotor, and new heavy-gauge, double-strength handle bars with cylinder fin and exhaust guard. Saw retains finger-tip control, automatic, no-stall clutch, full swivel transmission.

McCulloch "Sabertooth" Chain for Popular Saws

In January McCulloch Motors Corporation opened its new factory devoted entirely to the manufacture of saw chains for all popular makes of power saws. Called the "Sabertooth," the new chain is said to be 50 per cent stronger, yet to retain the fast, easy cutting qualities of chains formerly produced solely for use on McCulloch saws. Special steel alloys and the new Aus-Tempering process account for the great increase in strength and durability.

Forestry Employment

Positions Wanted

Woodlands executive available. Have resigned as assistant manager, woodlands department, of a large northeastern paper company. 28 years experience in the pulpwood business from cruiser to management. A "young" 46 years of age, personable, and in perfect physical condition. Top recommendations.
Box N, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, B.S.F., Michigan State, 1950, desires work in forest products utilization or research, management or management research, silviculture, or fire protection. Have experience in nursery work and insect control, and 3 years experience in forest products research at U. S. Forest Products Laboratory. Also am rated pilot in light aircraft, 25 years old, married. Minimum acceptable salary $5,000 annually.
Box O, Journal of Forestry, Mills Building, Washington 6, D. C.

Graduate forester, 34, married, family. Recently self-employed, but sold business and seeking employment. Experience with private and state agencies; chemical brush control; public utility and right-of-way clearance. Desires to relocate in Northwest or West, but will consider offer from any region.
Box Q, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, B.S.F., Univ. of Ga., 1935, desires job in management, utilization, or related industry. Experience: U. S. Forest Service in Timber Surveys, Management, Land Use, Agricultural Extension, FSA; who'esale lumber company in management fire control, logging, timber purchasing; past six years, private consultant in all phases of forest industry in Southeast. Age 42.
Box R, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, age 29, married, one child, B.S.F. forest management, Michigan State College, desires position in eastern or Lake States in management work or related field. Two years' experience in plantation and hardwood management.
Box S, Journal of Forestry, Mills Building, Washington 6, D. C.

Experience in wholesale lumber business, small home construction, pulpwood procurement, timber cruising, and utility forestry. Received B.S. degree in forest management, N. S. State, 1949. Age 25, married, two children. Desires employment with a wood-using industry in the South requiring a minimum of travel.
Box T, Journal of Forestry, Mills Building, Washington 6, D. C.

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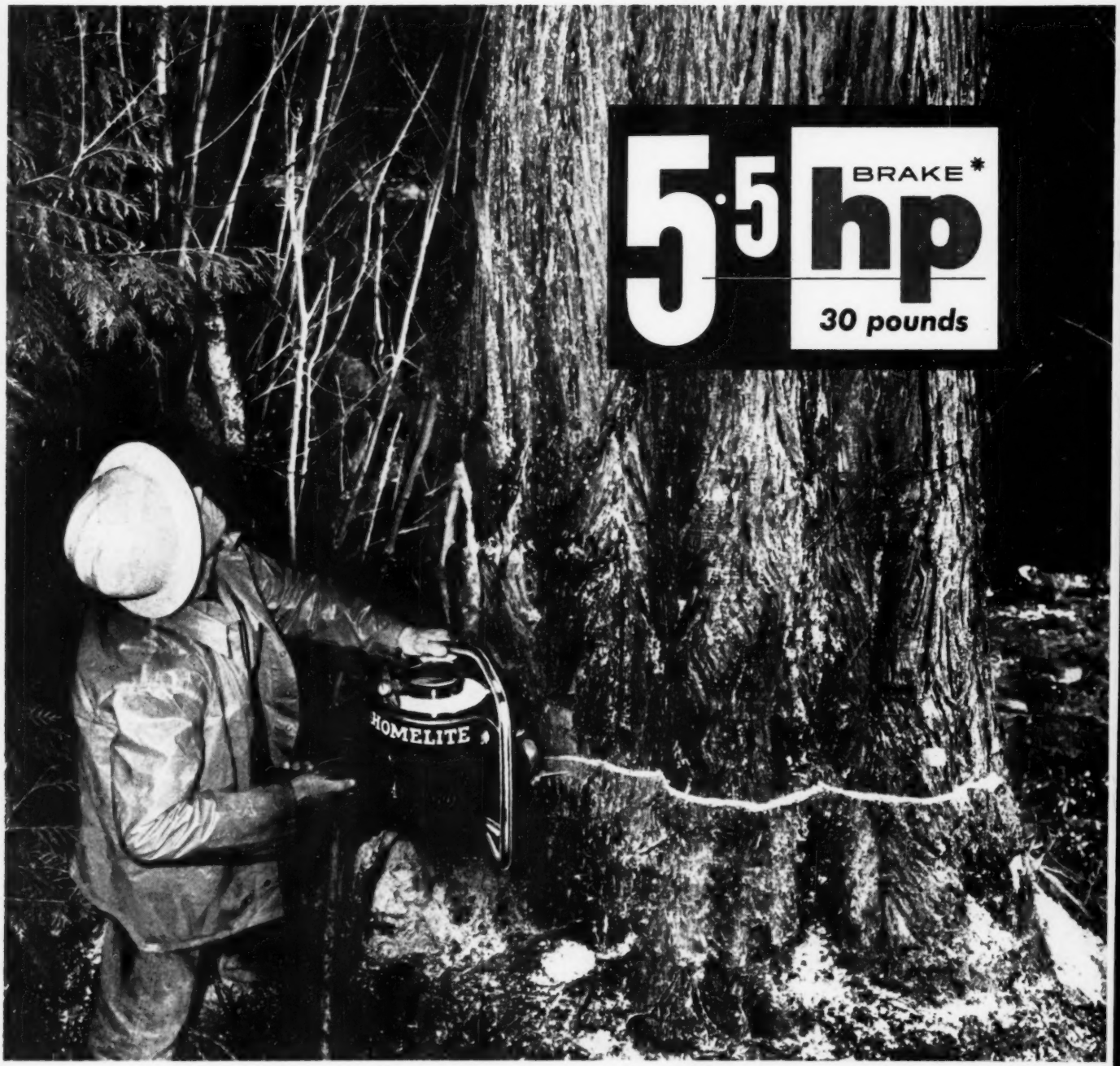

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